GRAPHIC SCIENCE

THE MAGAZINE FOR DRAFTSMEN

DON'T SPECIFY THE IMPOSSIBLE

FEBRUARY 1960

MICRO-MASTER®
105/35 mm
Miniaturization
Process

PHOTACT® – Photographic Papers, Cloths and Films

HELIOS® – Dry Diazo Papers, Cloths and Films

ONYX™ – Moist Diazo Papers and Cloths

BLUEPRINT PAPERS AND CLOTHS

DUPRO® – Wash-Off Process Cloths

MADURO® – Brownprint Paper and Cloths

STABILENE® – Dimensionally Stable Drafting, Scribing and Reproduction Film

ALBANENE® – Prepared Tracing Paper

PROFILE AND CROSS SECTION PAPERS AND CLOTHS, GRAPH SHEETS

PHOENIX® – Moisture Resistant Tracing Cloth

HERCULENE® – Drafting Film

K+E

The COMPLETE Line

for originals and reproductions

2037

KEUFFEL & ESSER CO.

NEW YORK • HOBOKEN, N. J. • DETROIT • CHICAGO • MILWAUKEE • ST. LOUIS • DALLAS • DENVER • SAN FRANCISCO • LOS ANGELES • SEATTLE • MONTREAL

GRAPHIC SCIENCE

THE MAGAZINE FOR DRAFTSMEN

FEBRUARY 1960

VOLUME 2 NUMBER 2

THIS ISSUE: 11,500 COPIES

ARTICLES

DEPARTMENTS

GRAPHIC SCIENCE—offering complete coverage of drafting, technical illustration and reproduction for chief draftsmen, supervisors and instructors.

GRAPHIC SCIENCE is published monthly by Kinelow Publishing Company, Inc., 103 Park Avenue, New York 17, N. Y. (MUrray Hill 5-1745). Charles E. Rhine, president; Paul Yake, vice president; David Z. Orlow, secretary-treasurer. GRAPHIC SCIENCE is published (printed) at 116 Main St., Norwalk, Conn. Address changes, undeliverable copies, and orders for subscriptions should be sent to Editorial Offices, 103 Park Avenue, New York 17, N. Y.

Postmaster: Form 3579 requested.

Subscription rates: $8.00 per year in the United States; $9.00 per year to Canada; $10.00 per year to other countries. Single copies: $1.00.

Accepted as controlled circulation publication at Norwalk, Conn. The name "GRAPHIC SCIENCE" is Registered, U.S. Patent Office.

Letters

The Complete Check List

Sirs:

In answer to Mr. Roth's letter in the December issue of GRAPHIC SCIENCE requesting "The Complete Check List," I am enclosing a copy of Barry Controls' Drawing Information Check List. We hope that this will help fulfill Mr. Roth's request.

The two articles in the December issue entitled "Recruiting and Training Draftsmen" and "Engineering and Drafting Supervisors" were excellent. More articles on the field of supervision, such as the one by Mr. George Schmidt would be greatly appreciated in future issues.

DWIGHT M. GRAVES
Barry Controls Incorporated
Watertown, Mass.

Editor's Note: The Barry Controls' Check List will be found on page 26.

Drafting & Education

Sirs:

I think that the GRAPHIC SCIENCE magazine fills a long required need to promote drafting as a profession.

Mr. L. E. Teppers' article "Recruiting and Training Draftsmen" in your December issue is very good. It is especially interesting to me since I am a mechanical engineer who spent 16 years in industry and last year changed to teaching.

Mr. Tepper omitted two very good sources of prospective draftsmen namely the Technical Institutes and Community Colleges. Most of these two-year schools of higher education have curricula in the mechanical and electrical fields which includes drafting along with other courses.

The need for expert training in drafting and design was recognized when the curriculum in mechanical design was planned at Dutchess Community College. Hence, the mechanical design students spend fifteen drawing room hours a week for the two school years learning drafting procedure and design technique.

The main point of this letter is to emphasize the role of the Technical Institute and Community College in training draftsmen and technicians. This is a relatively new source of manpower of which industry is not fully aware.

WILLIAM L. RYDER
Instructor Mechanical Design
Dutchess Community College
Poughkeepsie, N. Y.

Blueprint Course Wanted

Sirs:

We are enclosing the questionnaire from the first issue of GRAPHIC SCIENCE and should like to add that none of our magazines receive the attention that your first two issues received by the boys in our department.

I have been asked to conduct a course on "Blueprint Reading" as part of a Shop Training Program, so I am in the market for a ready-made course: text books, work books, etc.

Do you know where I can purchase sample material for this type of course in order for me to evaluate it?

R. S. WALLACE
Gillett & Eaton, Inc.
Lake City, Minnesota

Editor's Note: Can other readers help? We'll be happy to pass along to Mr. Wallace any information or suggestions.

Unique Venture

Sirs:

Not since French published the first edition of his *Engineering Drawing* has there been such a unique venture in publishing as GRAPHIC SCIENCE. I recall how draftsmen with years of experience added French to their reference material at the drawing board. Now we can look forward to the same enthusiasm by teachers and practicing draftsmen.

GRAPHIC SCIENCE brings education and industry closer together to the mutual benefit of both. We have just instituted a two-year technical drafting curriculum to meet a pressing need for trained draftsmen. Your publication can prove valuable in providing up-to-date information for the students.

Keep up the good work. Best wishes for the success of the venture.

F. PAULSEN
College of San Mateo
San Mateo, Calif.

Re: Simplified Drafting

Sirs:

In 1948 a book entitled *Simplified Drafting* by Messrs. Rau and Healy of General Electric Company was widely distributed to industrial firms, technical schools and colleges. Without a doubt this book is largely responsible for the present interest in this subject. Several firms have published manuals covering this subject for their own use, and institutes have been held at various colleges for engineering and drafting personnel.

While there are many points of disagreement between persons who have dared to venture an opinion on the subject, there is one point of agreement, namely, that no one set of hard and fast rules can be set up to cover all business requiring drafting. As one writer puts it, "We do not advocate that all companies adopt our, or anybody else's, methods for simplifying drawings. However, we do feel that individual firms should write their own local standards on this subject, and try them to determine for themselves whether or not they will save money."

Although our department is already following several simplified practices, we find that we must constantly review and investigate simpler and more economical practices.

One of the larger wastes in drafting time lies in making drawings more complete and exact than their purpose demands. This fanciness is a costly luxury which can be reduced.

Somewhere between the "too much" and the "not enough" is a category that all good drawings should fall into.

(Letters to the editor should be addressed to 103 Park Avenue, New York 17, New York. Names will be withheld upon request but all must be signed.)

No set of rules can be made to cover the thousands of kinds of drawings made, nor is it possible for any supervisor, no matter how well informed, to stand behind each draftsman while he is making his drawings. Therefore, each draftsman should so concentrate on his work at hand that he will find the "in between" spot and make his drawings accordingly.

Following are a few techniques which, although they are small in themselves, collectively add up to substantial savings in a draftsman's time. He must learn to apply them as often as possible. This is a matter of forming new habits, since for the older men at least, conventional drafting habits are well established.

(1) Small holes should be made free hand using approximate proportion. (2) Use a centerline notation to locate holes wherever possible. (3) Eliminate drawing of chamfers and inch marks. (4) Minimize cross-sectioning, making only partial views and partial sections where they will suffice. (5) Show dotted lines only when they are necessary. (6) Omit arrowheads except where necessary for clarity. (7) Minimize the number of views. (8) Use drawing templates where possible. (9) Hold paper size to a minimum. (10) Use freehand drawing where practical. (11) Avoid repetition of holes, louvers, etc. (12) Eliminate guidelines for lettering. (13) The right grade of pencil, well-sharpened, will do for all work on a drawing. (14) Use one line instead of two wherever two are not necessary. (15) Show only the dimensions on a drawing which are necessary to do the work required by the drawing. (16) Dimensions should be made clear, and should not be bunched up.

Undoubtedly, additional methods of simplification will become evident to those engaged in making drawings. Any, and all, methods should be used so long as the information is complete, concise, and accurate. Accuracy of the dimensions on the drawing is far more important than the accuracy of the scale used.

I hope that the information supplied above will stimulate the thinking of those interested in simplified drafting.

RAY STOWE

Chief Draftsman
Switchgear Department,
Allis-Chalmers Mfg. Co.
Milwaukee, Wisconsin

Notes & Comment

MODERN GRAPHICS forms the theme of the Midwinter Meeting of the Division of Engineering Graphics, American Society for Engineering Education, being held at Rolla, Missouri as we go to press. Session topics cover "Teaching Techniques," "Effective Programs in Engineering Graphics – How Shall They Be Taught?" and "Graphics in Industry."

Among the highlights of this latter session are "The Applications of Graphics in Highway Engineering," "The Engineer's Role as a Designer," and "The Application of Graphics and Nomography to Heat Transfer Studies."

Speakers include Earl D. Black, General Motors Institute, whose book, *Graphical Communication*, is reviewed on page 27 of this issue.

Expansion—Hawaii

MICROFILMING equipment and services have been expanded to include the 50th State according to an announcement by Recordak, Eastman Kodak subsidiary. Heading the new branch office, at 1055 Kapiolani Boulevard, Honolulu, is Frank E. Lehner, former manager of Recordak's Portland, Oregon office.

Standards

CLOSER COORDINATION between the drafting and reproduction area is being planned by the American Standards Association. The national organization is forming a liaison group with representatives from its microfilming, reproduction, and drafting committees. PH5-1, the ASA subcommittee on microfilm, has named Carl E. Nelson of Bell Telephone Laboratories as chairman of a working group consisting of Dale T. Kuebler of Ford Motor Co., and A. F. Davis of Dupont.

Similar working groups are to be named by PH5-3, the ASA committee on document reproduction without optical aids, and Y-14, the ASA group on Drafting Standards.

Microfilming

THE NATIONAL Microfilm Association, P.O. Box 386, Annapolis, Md., is planning a conference in New York April 19, 20, and 21.

More Meetings

THE DEPARTMENT of Defense Speaks on the New Military Drawing Requirements is the topic of the January meeting, Thursday, the 21st, of the Standards Engineers Society, New York Section. A four-man panel consisting of C. L. Miller, AFSS Center, Washington, for the Department of Defense, Mr. Russel Eaton, AMC, Wright-Patterson AF Base, Ohio, for the Air Force, Mr. C. A. Nazian, Frankford Arsenal, Philadelphia, for the Army, and Mr. J. H. Mars, Bureau of Naval Weapons, Washington, D. C., for the Navy, will give the presentation. The meeting topic centers about the requirements in the new DOD specification, MIL-D-70327.

Graphic Science March

THE NEXT ISSUE of Graphic Science will be devoted to the overall theme of Reproduction. Look for articles on the use of microfilming in the small engineering department, numerous case studies of reproduction departments, a new technique for reproducing electrical symbols on drawings, and an article on drawing requirements for reproduction, including specific points for checking.

Don't Specify the Impossible

Good design practice calls for thinking in terms of machining. Here are 11 design conditions to avoid in the interest of holding the line on manufacturing costs

by L. R. Smith

WHAT IS THE impossible? The impossible is that which is highly impractical today, because of time or cost, but which may very well be commonplace tomorrow.

Modern aircraft engineering is constantly attempting to take full advantage of the very latest processing and metallurgical experience available and, in many cases, is committed to use techniques not yet fully developed. This discussion will consider as "impossible," the highly impractical of today.

A COMPARISON

THE impractical is a condition of cost versus demand or time. For example, a comparison between the automotive and the aircraft industry reveal the automotive field to be a highly competitive business where large quantities are involved and the cost of producing the bits and pieces is probably of first importance consistant with reliability. Since weight is of secondary importance and strength of material may have a fairly high safety factor, tolerances may be relaxed and standard machining procedure can generally be used.

The aircraft industry is also in keen competition, but primarily on a performance and weight basis. Each and every aircraft part is designed, evaluated and tested under its own environmental and stress conditions to perform exactly as required and with a safety factor approaching one. The processes and tolerances must be more closely controlled to insure that all parts will duplicate the performance of the parts which have been tested.

When dealing with aircraft parts there are many conditions where it appears to be expedient to control the weight-to-strength ratio, which may seem totally unwarranted by those not associated with the field. For example, the allowable stock thickness tolerance may be reduced below the standard commercial tolerance, even at the expense of special selection. Non-functional holes may be drilled in unstressed areas, flanges may be scalloped between mounting holes, etc., to eliminate excessive weight, even at the expense of additional machining. Highly stressed parts may require a very fine surface finish to prevent fatigue failures, even

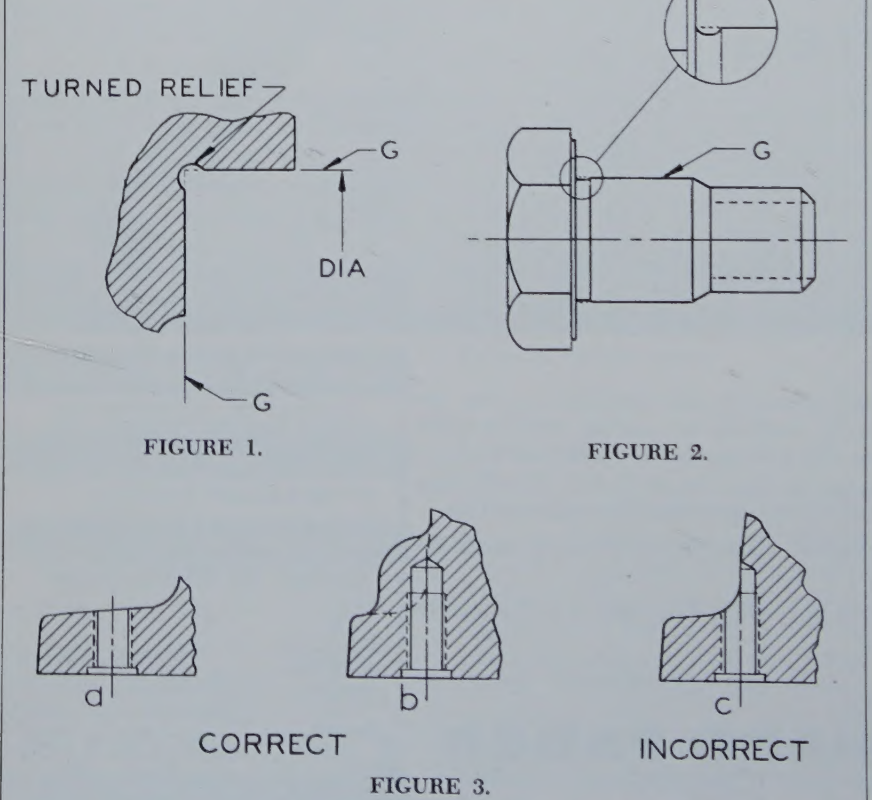


FIGURE 1.

FIGURE 2.

FIGURE 3.

though the surface is non-contacting.

Bearing the above-mentioned conditions in mind, it is easy to go overboard and specify close controls where they are not required, with a resultant loss of time and money. The following "don'ts" apply primarily to aircraft design; however, they may be worthy of consideration in any design work.

"DON'TS".

DON'T SPECIFY a surface control requiring a grind when a smooth, turned surface will serve the purpose.

Don't specify a close tolerance, just to keep the manufacturer on his toes, if it is not essential to the function of the part.

Don't specify a grind on two adjacent surfaces at right angles to each other without providing a relief in the corner; see Figure 1. Each surface should be ground independently and have a runout area. Also, the larger radius provided by the relief reduces stress concentration at an otherwise sharp corner. A similar case is shown in Figure 2, where a close tolerance shank diameter for a body bound bolt or shaft made from a hard material is desired. To meet the tolerance of the shank, grinding is necessary; however, a corner radius of the sharpness required under the head cannot be held on the grinding wheel and therefore, a relief should be provided.

Don't specify a tapped hole through a wall flange that does not break through clean, for the following reasons: first, a partial break through as shown in Figure 3c will tend to break taps and second, a great deal of burring will be required to eliminate snags and slivers. Figures 3a and 3b show acceptable methods of applying tapped holes for either through or blind applications.

Don't specify an angle drill (or any drill) without checking to see that there is a straight approach on line with the drill to the outside of the part, to enable a drive spindle to be used; see Figure 4. Similarly, when a spline or keyway is to be machined by a rotation tool, don't forget that it is necessary to provide clearance for the drive spindle; see Figure 5.

Don't design a mounting pad in such a way that machining cannot be accomplished in one continuous operation; i.e., either by permitting a rotating tool to be brought straight down on the pad for machining the entire surface, or by bringing a rotating tool down to the necessary height, entirely clear of the pad and then sweeping the pad. If the above cannot be accomplished and the rotating tool is brought down on a portion of the pad and the sweep then started from this position, the surface below the point of hesitation will be somewhat below the balance of the surface due to the momentary relaxing of pressure while the tool is rotating in one place; see Figure 6. Similarly, interrupted machining of flange faces, etc., should be avoided because, as the tool passes over the gap in the material, tool and holder will relax; when the material is again encountered, the impact will start the

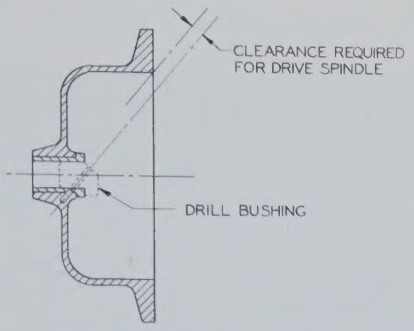


FIGURE 4.

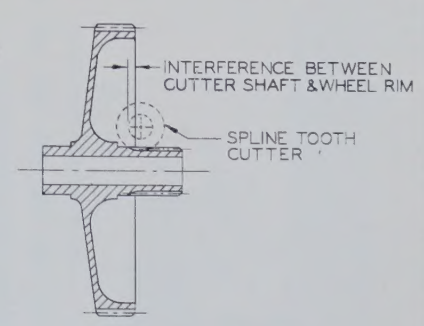


FIGURE 5.

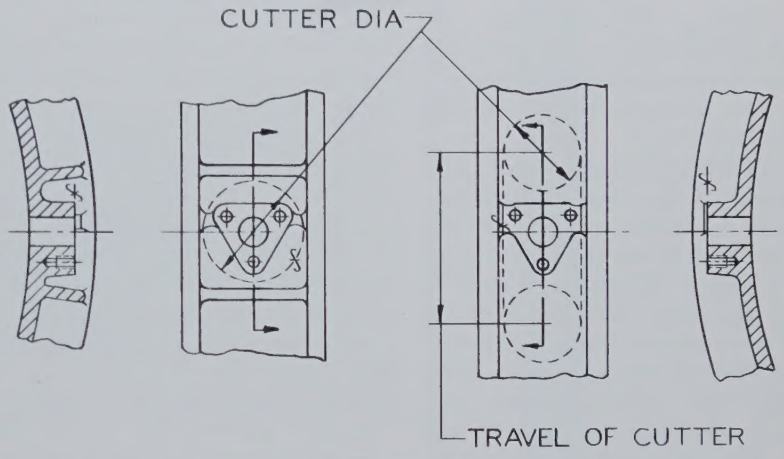


FIGURE 6.

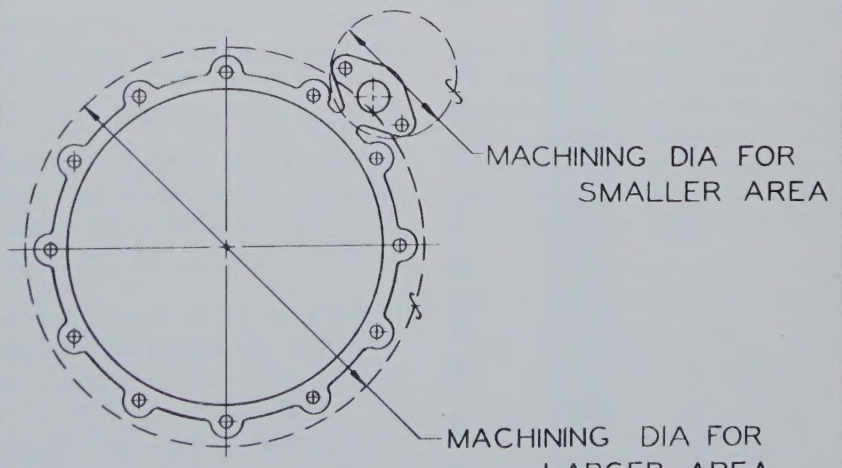


FIGURE 7.

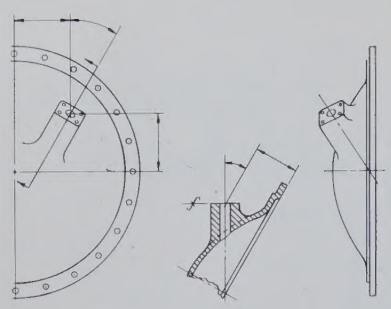


FIGURE 8.

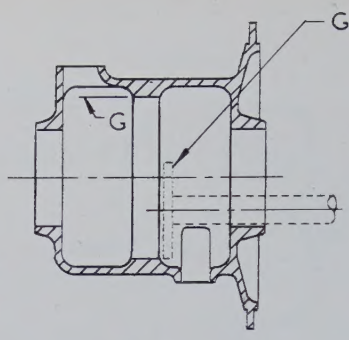


FIGURE 9.

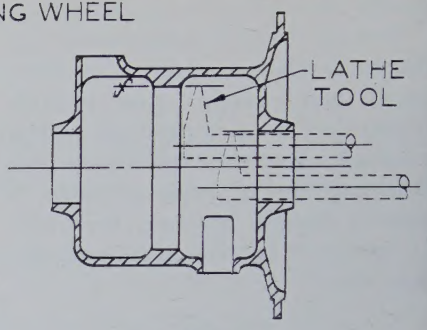


FIGURE 10.

tool vibrating which, in turn, will impart irregularities to the surface for a short distance beyond the interruption. This is especially true for the harder materials.

Don't specify a single surface to be accomplished by two different machining operations and expect the surface to be in one plane. An example of this is shown on Figure 7, where the large diameter must be machined to give a flange face a sealing surface and where—partially within this area—another smaller area must be machined to seal with another item. The smaller area must be machined to slightly below the larger area to insure proper sealing characteristics.

Don't specify both angles of compound angular features from the common datum of the part, because all types of machining setups employ an arrangement whereby the second angle is fixed in relation to the plane of the first angle; see Figure 8. If the drawings specify one angle with a section taken through the feature on the specified angle and the second angle shown on the section, the angles may be used directly by manufacturing without shop calculation or the confusion sometimes existing when the angles are small.

Don't specify an internal inside diameter too large for the required tooling to be entered through adjacent inside diameters. For example, the largest ID that could be machined would be three times the smallest adjacent ID, minus twice the diameter of the tool support bar. If the ID requires grinding, the largest possible diameter would be twice the smallest adjacent diameter, minus the diameter of the drive spindle; see Figures 9 and 10. Both of these conditions neglect working clearances and limit stack.

Don't specify a back spotfacing operation without providing space for loading the cutter on the spindle; see Figure 11. Back spotfacing should be avoided if at all possible, as it is an expensive and time-consuming operation. Spotfacing should also be eliminated in favor of turning the whole piece, if practical, because it is a faster operation—especially if the part has a common center which must be established for other machining. This also reduces weight in cases where built-up bosses have not been provided; see Figure 12.

Don't specify a part which can be reversed or rotated physically, but cannot be so relocated functionally. This can be avoided by one of two methods: make the part so it can be used functionally in any position in which it can be assembled; or make the part so that it cannot be assembled wrong by use of an out-of-step hole, pin and clearance hole, or by other means. This is very important because, if it is possible to assemble a part wrong, rest assured that it will be assembled wrong somewhere along the line. Verbal instructions and installation warning notes cannot be relied upon.

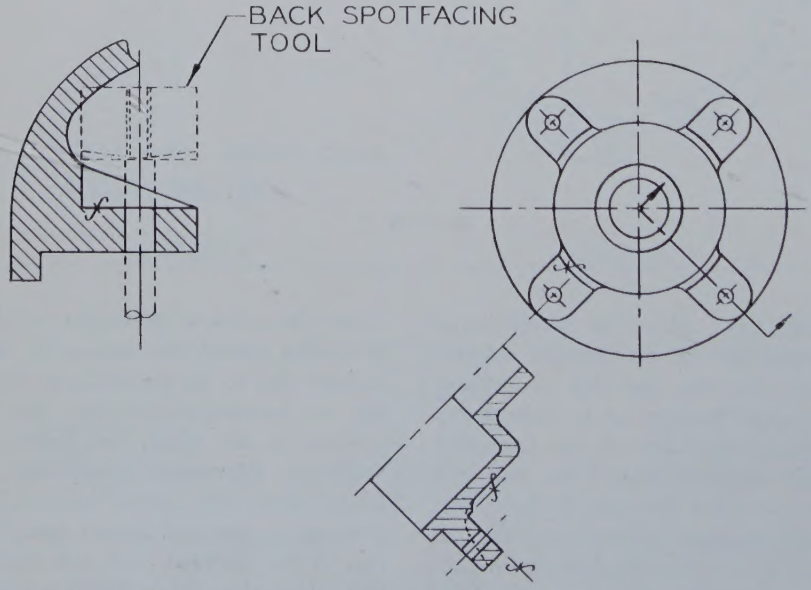


FIGURE 11.

FIGURE 12.

Summary

The foregoing "don'ts" are a few of the many little considerations that are frequently overlooked in design and drafting. As stated at the beginning of this article, no one of these items is "impossible"; nothing is impossible. However, they are to be avoided in good design practice, because they can prove troublesome in the manufacturing operation.

The Author

L. R. Smith is chief draftsman, Allison Division, General Motors Corp., Indianapolis, Indiana.

OZALID NEWSLETTER

NEWS AND IDEAS TO HELP YOU WITH ENGINEERING REPRODUCTION AND DRAFTING

Repro room at I-T-E, showing processing of Information Sheets and standard engineering drawings on Ozalid machines. Simple system saves hours of drafting time for the company.

Short-cut system for custom orders

To help turn out "job shop" work at assembly line speed, the I-T-E Circuit Breaker Company of Philadelphia has devised a simple "Information Sheet" that does away with considerable retracing and revising of engineering prints.

More than 70% of I-T-E orders are for custom-designed equipment using standard components. Revising standard drawings to meet customer specs on each order would saddle I-T-E's engineering department with a nearly impossible work load.

So the Information Sheet is used instead. It's an 8½" x 11" tracing form—with printed title blocks—quickly reproduced on the company's Ozalid whiteprinters. Here's how it works:

An order comes in—for 5KV metal-clad switchgear, for instance. A fast freehand sketch of the switchgear is drawn on the Information Sheet. Drawing numbers of standard components and quantity of prints needed are noted on the Sheet.

Then, copies of the Sheet and the required standard drawings are run in the I-T-E repro room. These, with the shop order, go to Manufacturing. When the order is completed, the Information Sheet is returned to the customer file for reference.

This simple short cut with Ozalid whiteprinting saves untold hours of engineering time and gives I-T-E customers faster, more efficient service.

Colors speak louder than words

A simple way to make your security personnel's job a lot easier is to color-code all classified material by using Ozalid sensitized color-copy papers. Colors don't have to be read. Guards can spot restricted or top-secret prints at a glance. Clerks can't make routing mistakes.

To help you devise your own color-coding systems, Ozalid offers papers with eleven image-and-stock color combinations. For example, use black image on yellow stock (instead of traditional blue on white) to code prints of preliminary drawings. Potential uses for color-coding in engineering paper work are virtually unlimited: shop orders, bills of material, spec sheets, change notices, cost estimates, etc., etc.

Like a copy of our new Color-Coding Booklet? It tells how a truly versatile, full-range color-coding system can be yours with as little effort as it takes to run prints that are black on white.

Just write to Ozalid, Johnson City, New York. Booklet No. VV2.

New blue-tint Ozacloth cuts glare, saves eyes

It's bad enough to have *people* glare at you. When your drafting materials glare too, one should take steps. Our research people have—by building a delicate blue tint into our new black-line Ozacloth 101 CZB. It provides excellent contrast between background and dye image—cuts glare, reduces eye strain, makes duplicate originals that are easy to read and work with. Other features? Highest printing speed of any cloth intermediate . . . and a plastic matte surface *on both sides* which accepts pencil, ink or typewriter . . . and keeps sheets from sticking together in files. Write Ozalid at Johnson City, New York, for free descriptive literature on blue tint Ozacloth.

Ozalid—*Division of General Aniline & Film Corp. • In Canada: Hughes-Owens Co., Ltd., Montreal*

Heat Developing Films

An unusual group of materials for graphic reproduction departments is sensitive to ultraviolet light, has a photographic speed several times that of diazotype films, and requires no darkroom or chemicals.

by Floyd T. Neth

PHOTOGRAPHIC MATERIALS based on a fundamentally new concept in photography — light scattering—are assuming an important place in the graphics reproduction departments of many companies. In conventional photographic materials, the image is formed as the result of the absorption of light by colored material. In Kalfax* materials the image is the result of the scattering (reflection) of light by microscopic centers, more or less spherical in shape.

The light scattering image is composed of thousands of microscopic bubbles blown in a plastic layer. These scattering centers are so small that the image of a line 0.005 inches wide and one inch long would contain more than 25 million. For conceptual purposes these scattering centers can be thought of as highly efficient spherical mirrors, reflecting the light striking them away from its direction of incidence.

When viewed from the direction of incidence of the light, the light scattering image appears white because it reflects the light in the same manner as a diffuse reflector. When the image is used as a transparency for projection or print through, the scattering centers act as opaque particles casting shadows. Thus the image, which viewed directly looks white and transparent, projects like a normal black and white transparency.

The light scattering phenomenon has profound implications on consideration of the contrast of the projected image. A transparency in which the image is barely discernible by direct viewing can give quite adequate contrast on projection. Also very high quality white prints can be produced from a transparency which appears to be quite low in contrast by direct viewing.

While the photographic mechanism of the materials is of considerable interest to researchers and academicians, the characteristic of most significance to the reproduction department is the ease of producing the image. The image is produced by ultraviolet light and heat only. No darkroom or chemicals are required at any stage in the process.

The photographic emulsion consists of photosensitive compounds dispersed in a plastic vehicle. These compounds, when exposed to ultraviolet light, are decomposed to produce gaseous products. Upon heating, the plastic containing this gas softens and allows the gas pressure to blow microscopic bubbles. These bubbles scatter light efficiently.

Exposure may be made with any light having a significant ultraviolet component. Black light fluorescent lamps and mercury vapor lamps such

*Kalfax is a registered trademark used by Kalvar corporation, 909 South Broad St., New Orleans 25, La. to identify its heat developing films and papers.

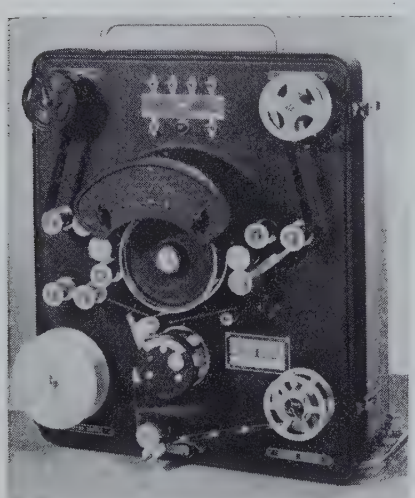
as those used in white print machines are the best exposure sources.

Development can be accomplished by any convenient heat source. For best results, however, careful control of development temperature and time is important. The hot roll-type developers develop for one second at 235-245°F. Adequate development can also be obtained by immersing the film in boiling water for 2 seconds.

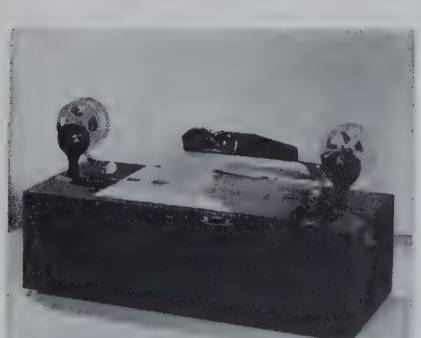
Fixation after exposure and development is required when the heat developing film is to be used as a master for production of copies onto ultraviolet sensitive printing materials, or where it will be used under conditions of intense light and heat. Fixing is accomplished by exposing the material overall to ultraviolet light at a temperature below 110°F and allowing 24 hours for the gas to diffuse out of the film. After this, the material may be used as any other photographic material.

Because the gas produced by the photodecomposition can diffuse out of the material without producing a visible image, development should follow immediately after exposure. Scattering centers are produced only in the areas which are struck by light. Hence, the film is negative working in normal use. A positive is produced from a negative, and a negative from a positive.

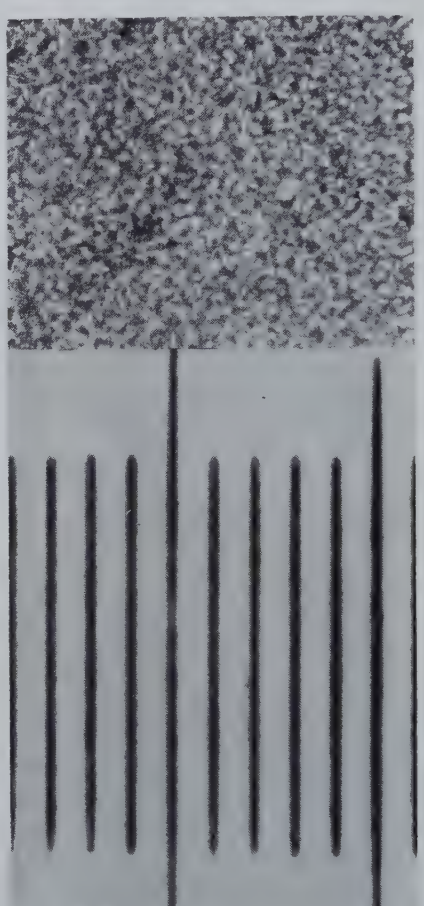
The films have certain advantages worthy of consideration by reproduction departments in addition to their ease of processing. Among these are unusual dimensional stability afforded by the Mylar polyester film base, indefinite shelf-life under normal storage conditions, unusual image stability to light, moisture, and chemicals, excellent image resolution, and photographic speed several times that of diazotype films.



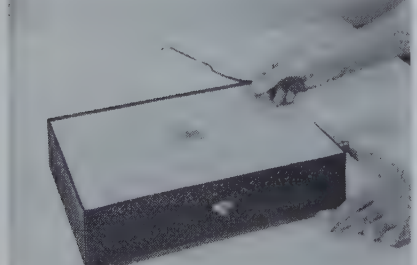
MICROFILM printer-processor for high speed roll-to-roll microfilm printing.



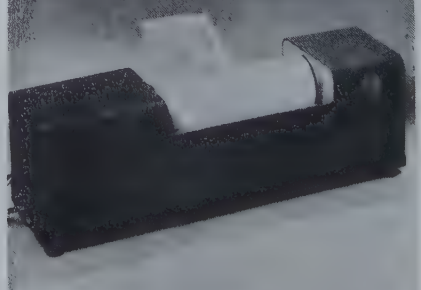
PRINTER for copying roll microfilm to KalvaKards in strips or single frames.



SCATTERING centers of microfilm emulsion, above, at 500X enlargement. Ten micro grid below is for comparison.



A MICROFRAME developer for developing exposed areas of cards only, permitting additions weeks, or years later.



DEVELOPER for developing KalvaKards and Kalfax sheet film.

Microfilm Reproduction

Microfilm and equipment are finding wide application in the reproduction of engineering drawings. Certain unique characteristics of the new material are leading to new concepts in storage and retrieval systems.

One system in which the microfilm plays a major role solves the problem of providing reference drawings for service centers throughout the world. In this system the original engineering drawings of all the component parts of a machine are microfilmed. After microfilming, the original drawings are destroyed and the negative microfilm is retained as the original.

From this original as many roll copies as required are made onto heat-developing roll microfilm. The microfilm printer-processor model B is used for this reproduction. The microimages are then mounted in tabulating aperature cards coded for automatic sorting. When a particular drawing is required for reference either of two courses of action may be taken. The particular card may be pulled from the stack and a duplicate microfilm made for use in a viewer, or an enlargement may be made using any suitable enlarger. In this particular system an electrostatic enlarger is generally used because of the convenience of dry processing of the print and to obtain a positive print from the positive microfilm in the file.

The tabulating card with microfilm inserts is particularly well adapted for

use where very large numbers of drawings make machine filing and sorting desirable. In smaller installations where automatic sorting systems are not needed, another system is provided by the new microfilm. In this system the original drawing is microfilmed in the normal manner. The developed microimages are transferred from the roll negative to film cards, consisting of the new microfilm emulsion coated on 5-mil Mylar base for ease of handling. The resulting card is available in tabulating card size with a ⅜-inch treated strip across the top for coding with typewriter or pencil. All standard card file sizes are available without the coding strip. These microimage file cards enable the engineer, production supervisor, maintenance supervisor, executive and others to develop a wide variety of convenient systems for providing engineering information at the point where it is needed with a minimum of time lost. For instance, a production supervisor can maintain a complete file of engineering drawings in his desk drawer on all the machines in production for quick reference. If microfilm viewers are available to the machinists on the production lines, the microimage may be used as a working drawing. The new microfilm alone makes this feasible because of its excellent wear resistance and resistance to atmospheric conditions. If the film becomes soiled or greasy, it can be restored to its original condition merely by washing with soap and water.

Unique Feature

One of the unique features of the new microfilm makes possible the so-called add-a-frame system: because Kalfax is developed by heat alone, unexposed areas of the card need not be desensitized on developing. By developing only the area actually used for the image the rest is preserved for additional postings later. Thus an active file may be maintained to which additions may be made as desired. The unexposed areas are protected during use by a yellow plastic jacket. One use to which this feature might be placed is in recording changes in drawings. If space is provided on the card for additional images, microfilms showing changes may be added. In this manner, the original and the revision are preserved together for convenience of reference.

The use of the film for full-size reproduction masters is based upon three outstanding characteristics—the high actinic density of the image and the low actinic density of the transparent areas, the excellent dimensional stability afforded by the base, and the permanence of the image in storage under a wide variety of conditions. The high transparency of the clear areas means that whiteprint machines may be run at highest speeds when making prints. The dimensional stability of the base is sufficient to allow the master to be used directly as a template for parts layout. This is of particular interest in connection with the use of scribing techniques. (See Graphic Science, Vol. I, No. I.) The original scribed drawing may be contact printed to the film to produce a positive copy of excellent fidelity. This may then be used as the master for printing to the metal stock coated with a diazotype emulsion. The original is safeguarded against damage in layout and a positive copy is made on the layout for maximum readability.

An interesting application for the new sheet film arises in connection with the diazo microfilm enlargers. The exposure times for preparing enlargements onto diazo paper in these machines may be more than a minute. If more than one print is required it is often more economical to make the initial enlargement onto the film and run off prints in a whiteprint machine at a few seconds per print, than to make several enlargements directly to diazo paper. If a single enlargement is needed time may be saved by making a Kalfax positive from the negative microfilm. The high transparency of the background may reduce the exposure time in the enlarger to less than one-third that required by the negative. An accompanying advantage is the positive rather than negative diazo print.

These are only a few of the applications in the engineering drawing reproduction field in which the unique characteristics of the films have found uses.

The Author

Floyd T. Neth, Ph.D., is Director of Research at Kalvar Corporation, New Orleans 25, Louisiana.

Operations and Procedures for Engineering and Drafting Supervisors

Improvement Studies and Work Simplification

The Rating of Workers

Parts V and VI

by George C. Schmidt

Most steps taken to improve working methods, simplify procedures, and cut cost, center on time and therefore every supervisor should know something about the uses of time.

Whether it is the time of his men, the time of his equipment and services, or his own time, any improvement in the way he uses it will mean an increase in production or a better job. Over and over again all of us have heard such remarks as, "We didn't have time to get any more done," or "We didn't have time to do as good a job as we would have liked."

V. Improvement Studies and Work Simplification

Now let us consider the steps that must be taken to "make" the time required for better work and more of it.

What is called *work simplification* is just a label for finding the easiest way to do things. The goal of work simplification is to get more done with less effort. We are endeavoring to work smarter instead of harder.

To get best results, it cannot be undertaken haphazardly. There is a pattern to be followed, and that pattern, basically, has five parts: (1) selection, (2) analysis, (3) investigation, (4) development and (5) application.

Selection

Select the operation to be improved. This is important because there is no reason to select for study something that will seldom if ever be repeated, or select something from which the savings derived would not offset the costs of making the improvement. No real benefit could result from such studies.

There are four types of jobs that cry out for improvement:

The "bottle-neck." The bottle-neck slows up everything in front of it and everything behind it. These are the jobs to be tackled first. The smoothly running jobs can be tackled later on.

The "time - consumers." Time, as was pointed out, is what you are working with. The jobs that take a lot of time also offer greater opportunities for improvement. Is there needless volume of preliminary design and sketching?

The "run-abouts." These are the jobs requiring a lot of chasing about.

The "wasters." Wherever there is noticeable waste of time, energy or materials, there is usually poor organization. These are also the jobs likely to be missed until it is too late.

Analysis

Break it down in detail. There are very few jobs that can be improved in their entirety, but most jobs can be improved in part.

A job consists of three parts: making ready, doing, and putting away. You cannot do much in the way of improvement until you have pigeonholed the parts of a job into one or the other of these three categories. There is a very good reason for doing this: making ready and putting away add to the cost of the finished job, but they do not add to its value. Of course, you cannot get away from them entirely, but the more steps you can eliminate the better off you are.

To make the analysis, we make a detailed breakdown, listing every step in the order in which it is done, classifying it as part of the making ready, part of the doing, or part of the putting away. A sort of "process flow chart" approach.

This detailed breakdown is made so as to study only one thing at a time.

Investigation

Take each of the parts developed through analysis and study it in detail.

The investigation phase simply involves questions. It consists of questions you ask yourself and for which you try to find answers.

Editor's Note: Parts I, II, III, and IV of George C. Schmidt's article appeared in GRAPHIC SCIENCE for December and January.

Be sure to watch for the Appendix to this article, offering, and we quote the author, ". . . a series of supplementary, helpful check listings for the qualification, selection, training and development of your supervisors."

When you start to investigate, tackle the "doing" items first. If you can eliminate an item in this class, you will naturally eliminate the "making ready" and "putting away" connected with it. Also, if you change a "doing" step, it is likely that the other classes related to that step will require some changes, too.

The basic questions to be employed are: What is done? Why is it done at all? What else could accomplish the same result?

As a first step, decide what is being done and why it is being done. When writing the answers to the question, "What else could accomplish the same result?" list every sensible alternate. It is the quality of suggested alternates and not their quantity which should interest you.

Where is it done? Why is it done there? Where else could it be done as well? Is one section *tracing* the work of another section before going on? Could not an intermediate print be provided?

When is it done? Why is it done then? At what other time could it be done as well?

These are important questions when bottlenecks are developing. The answers to the "Where" questions may be the key to improvement. "When?" and "Where?" work hand in hand.

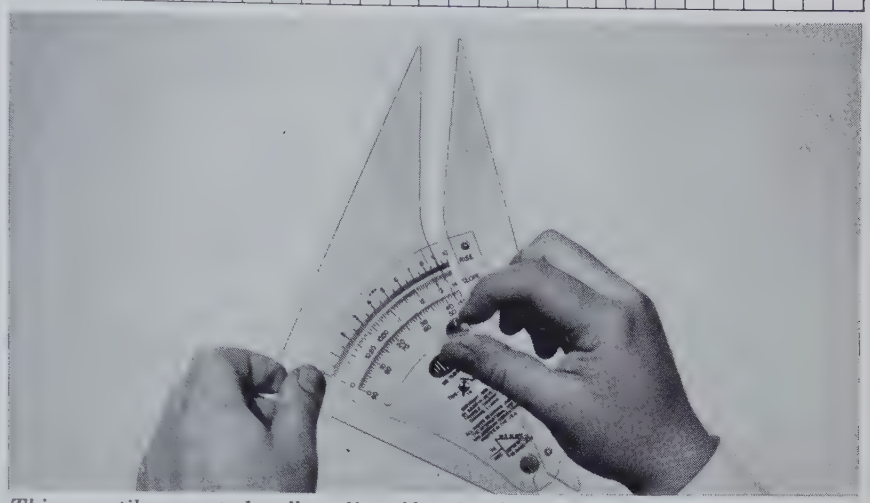
Who does it? Why does this person or group do it? Who else could do it just as well?

In this connection we are not thinking of outright substitution. Electrical work cannot, of course, be done well by mechanical men or vice versa. But the "Who?" question may suggest that there may be an individual or a combination of men, accustomed to working together, or more familiar with some phase of the work, who may be able to do a better job. A man who is a fine worker on his own, for example, may not do so well as a part of a group and an improvement can be brought about by a simple change of personnel.

How is it done? Why is it done that way? How else could it be done as well?

This question, as well as the first question of "What is done?" will draw attention primarily to the blind following of precedents or customs simply because that is the way something has always been done.

DRAFTING TRENDS



This versatile, easy-to-handle, adjustable triangle is made of yellow-tinted optical-grade acrylic plastic. A clean-cut oval track fitted with metal knurled knob assures ease of operation and lasting tight fit.

New combination protractor-triangle speeds up drafting

Architects, Engineers, Builders, Field Surveyors, Mathematicians—anyone who develops solutions to measurement problems indirectly to determine a wanted measurement graphically or mathematically—will find the Trig-Matk Adjustable Triangle a handy tool. It eliminates much of the graphic work necessary in estimating results or in checking for correct answers.

Versatility with accuracy

Basically the new POST Trig-Matk Adjustable Triangle is a mathematician's tool—accurate to three decimal places.

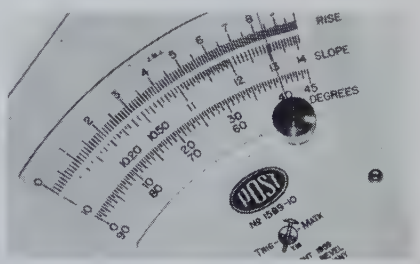
It combines the functions of a protractor and a triangle into a simple unit, with two fundamental trigonometric relationships of a right triangle. The Trig-Matk provides accuracy within 0.1% in problems dealing with any of the six trigonometric ratios of the sides of a right triangle.

The adjustable protractor has three sets of graduations. One set is graduated in half degrees, labeled *Degrees*, and permits the use of the Trig-Matk as a protractor setting for determining any angle from 0 to 90 degrees.

The second set of graduations, labeled *Slope*, shows directly the *Secant* trigonometric ratio of the angle indicated on the degree scale. The third scale, labeled *Rise*, indicates directly the *Tangent* trigonometric ratio shown on the degree scale.

Examples

This new tool has a host of drafting and engineering applications. Highway designers find the Trig-Matk very useful when making cross sections of roadways at ground level or below. By setting the *Slope* scale to the degree desired, road-curve grades are automatically determined. The protractor can be used to determine the angle of highway ingress and egress lanes.



An indicated angle of 40 degrees on the Trig-Matk (1589) shows directly that the Rise is 8.4 to the base of 10.

Structural Engineers will find the Trig-Matk Adjustable Triangle a simple tool, eliminating the use of both a scale and individual triangles. In addition to the time saved, many of the errors usually associated with the older method are avoided. The Trig-Matk design eliminates the need of frequent reference to handbooks for information on various bevels.

Two Bases

The Trig-Matk No. 1589-12 has a 12″ base scale for handy calculation in terms of feet and inches. Number 1589-10 has a metric base scale of 10.

Keep posted on all the latest trends in drafting. Consult your local POST *dealer, or write to Frederick Post Co., 3656 North Avondale Ave., Chicago 18, Ill.*

POST

SENSITIZED PAPERS & CLOTHS • TRACING & DRAWING MEDIUMS • DRAWING INSTRUMENTS & SLIDE RULES
ENGINEERING EQUIPMENT & DRAFTING SUPPLIES • FIELD EQUIPMENT & DRAFTING FURNITURE

NOW...low cost offset paper

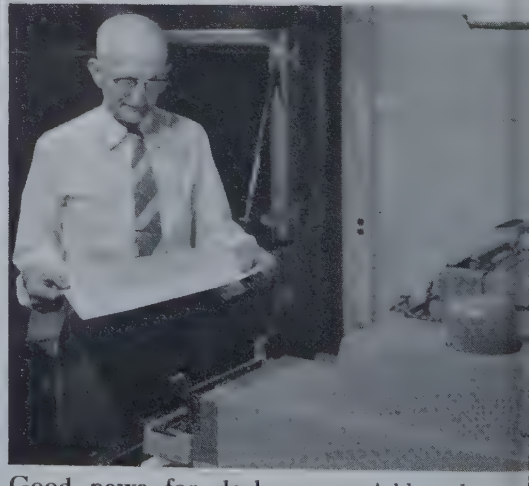
in just 2 minutes

NEW FROM KODAK...

... for all users of offset duplicator

Four ways to use new Kodak Ektalith Method

Sleight of hand in full roomlight. Ingenious Ektalith Loader-Processor is used to load high-speed Ektalith Transfer Paper for exposure to camera . . . and to process exposed sheet. Attached Ektalith Transfer Unit lets you put image on paper plate in full roomlight. Complete installation costs less than $600 . . . teams up with almost any office camera.



Good news for darkrooms. Add a low-co Kodak Ektalith Processor and Transfer Unit to you setup and you're all set to turn out camera-quali paper plates. Expose Ektalith Transfer Paper in pro ess camera in usual manner. Complete job in Ektalit equipment under red safelight. Corrections can b made with eraser, additions readily made.

nasters made photographically

vith Kodak Ektalith Method!

New low-cost Kodak Ektalith Method brings the speed, quality and flexibility of camera copying to "paper platemaking." Makes "short run" jobs easier, more economical—*and cuts capital investment*—for users of *all types* of popular office-size duplicators.

Simple as A-B-C. Just three quick steps for a high-quality master (reduced, enlarged, same size) that will give you hundreds of sharp, clean copies of office forms, engineering drawings—all line and halftone material.

1. **Expose** high-speed Kodak Ektalith Transfer Paper using your present copy or process camera.
2. **Process** in ordinary roomlight with ingenious new Kodak Ektalith Loader-Processor. Or in darkroom with a Kodak Ektalith Processor.
3. **Transfer** to paper plate with Kodak Ektalith Transfer Unit in roomlight or darkroom.

Total time—from shooting the original subject to "on the duplicator"—just 2 minutes.

Kodak Quality. Whether you're copying line work or halftones, the Ektalith method assures sharp reproduction of the minutest detail.

Solid blacks are reproduced alongside fine detail without mottling. Backgrounds remain clean—are even cleaned up, as in the case of worn, "yellowed" engineering drawings. Not to be overlooked either is the uniformity and wide latitude of high-speed Ektalith Transfer Paper which lets you handle those "101" different office jobs faster and at lower cost.

In short, the Ektalith Method is *another* important contribution by Eastman Kodak to the Graphic Arts Industry—well worth your immediate attention.

Phone your local Kodak Ektalith Dealer for further details, or write:

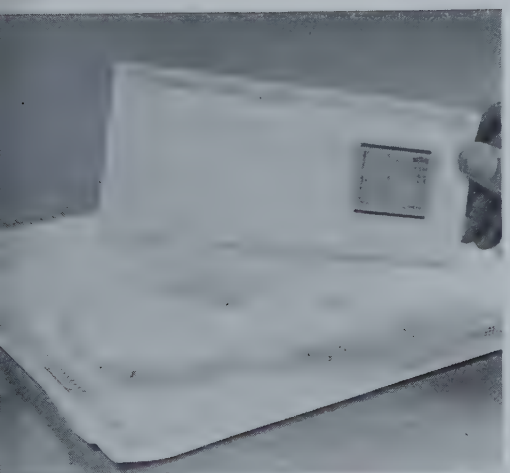
Eastman Kodak Company, Graphic Reproduction Division, Rochester 4, N. Y.

KODAK

Ektalith

METHOD

... puts you ahead in offset



"natural" for microfilm users. Blowups of ineering drawings and other reduced data can be de on Ektalith Transfer Paper in standard en- gers from microfilm positives. Copies can be made ectly from Transfer Paper in Kodak Ektalith py Unit. If more copies are called for, simply use alith Transfer Unit to make plate.

Big savings in systems work. Need 10 to 20 sharp copies of office forms, orders, reports? No platemaking is required when you team up your copying camera with Ektalith Loader-Processor and Ektalith Copy Unit. Entire job can be done in full roomlight . . . copies made fast and conveniently.

Kodak
TRADE MARK

There are always several ways of doing something. Which method is best adapted to our needs? This question of "How is it done?" may also be considered as the question of "With what is it to be done?" And this will perhaps lead to a critical examination of reproduction processes, forms, and data gathering procedures.

Using the questioning approach discussed above, the reason for the existing method is established. If this is found not to be entirely satisfactory, the next step is to indicate other ways of arriving at the necessary result. Alternate possibilities are weighed in the light of your general experience and your knowledge of the job itself.

In using the questioning approach, you must: (1) Base your conclusions on the best available *facts* and not on guesses or opinions. (2) Work with basic *causes*. Do not be satisfied to go back only to their effects. (3) Look for *reasons* and do not be satisfied with excuses.

It is not enough to merely list the material as it is gathered. You should examine and re-examine it and then evaluate it in the light of your judgment and experience.

Development

Work out the improved procedure. After the investigation has indicated the possibilities, go on to *develop* the best method suggested by these possibilities.

When the "Why?" has been applied to the information about the existing situation brought out by "What?", "Where?", "When?", "Who?", and "How?", it tends to result in one or another of the following courses:

Elimination of some operations.

Combination of operations.

Rearrangement of the sequence of the operations.

Simplification.

Complete elimination, when it has no effect on the end product or result, is, of course, most desirable. It cuts out the deadwood. It is surprising how often things that are done as a matter of routine or of habit need not be done at all. Entirely too many situations which are studied for improvement should be eliminated instead.

"Where?," "When?," and "Who?," may lead to considerable improvement by suggesting the combining of operations. The combination of two or more steps invariably leads to reduction of direct labor costs with fewer people needed to do the work.

When a study results in a better sequence of operations, it opens the door to even further elimination and combinations.

Application

Put the new procedure into application on the job. Theoretically, the new method should work. But we cannot be sure until we put it into use. This cannot usually be done by sheer mandate and against all opposition, reasonable or otherwise.

We must study the effect which the change will have and make sure that it is not only technically satisfactory but that it is acceptable to individuals, to other departments, and to other sections.

Departments are made up of individuals, and to get a favorable reception for the improvement, we must consider the individual.

Cooperation is based on understanding. Changes in methods mean changes in the way the work is done. Some people will not take kindly to changes, especially radical changes, unless they thoroughly understand why the changes have been made and what they are expected to accomplish. It is only human to be suspicious of what is not understood and to resent a change because it seems to imply criticism. Some men, especially the old-timers, may feel that a change will threaten their security. They have become accustomed to doing things in a certain way and have become very adept. Their experience offsets their lack of youth. Then a change comes along and they feel less secure because of the unfamiliar elements which have been introduced.

One way to gain the cooperation of the worker is to keep him informed of what you are trying to do. If possible, get him to assist in the development of the idea. Finally, give credit where credit is due. Acknowledge any help you may have received.

Remember, work with facts, not opinions; with causes, not effects; with reasons, not excuses.

VI—The Rating of Workers

One of the most difficult duties of a supervisor is the "rating" of an employee when management requests a recommendation or an evaluation of abilities. On one hand, the supervisor wishes to be fair to the man, and on the other hand it is important that what he says will have real value to management.

Not only should such a report be as accurate as possible, but the information it contains should be the right kind of information. It is very human to try to put a man in the best possible light and to emphasize his good points out of all proportion while sliding over or completely ignoring his bad ones. This is not fair to the company, or is it fair to the other workers. It is equally unfair to allow the bad points to outweigh the good ones.

Value of Merit Rating to Management

Even when a company does not have a formal rating system, with forms to be filled out, it will certainly expect a supervisor to be prepared to appraise the performance of his subordinates. This is especially true when promotion to better paying jobs with greater responsibility is based on merit.

Many union contracts and statements of company policy recognize merit as a basis or a factor in promotions, layoffs, salary changes, etc. An honest technique promotes employee satisfaction by assuring fair treatment. When the company is faced with the need for rapid expansion or the manning of large jobs, much time is saved when good reports from supervisors are available. On the other hand, companies that do not have such reports available will sometimes overlook good men in their own organization with a consequent loss of employee morale and production.

As such reports accumulate, they afford a protection for the employee against the snap judgments of individuals when there is a change of assignment.

Value of Merit Rating to the Supervisor

A supervisor who decides on the merits of a man or who makes

his recommendations impulsively may find his statements challenged and find himself unable to justify his decisions; but if he has carefully weighed the factors involved, and is able to show that he has done so, his decision will be respected by both management and workers.

There is, as has been said, a very natural tendency to be lenient in evaluations or, as it is usually put, to "give a man a break." There is nothing to condemn in this practice if every worker is given the same break. However, the only way to do this is to give an absolutely honest and unbiased opinion, for unless this is done, differences between good, average, and poor workers will not be recognized.

Above all, the supervisor should never "guess." Although he should be able to find an answer based on his own observation to each of the questions, if he cannot do this, he should make no statement at all on the doubtful point. However, the questions cover only matters which should come within the personal knoweldge of the supervisor.

Employee Performance Appraisal

The following group of subjects and questions are typical of those essential factors found on most performance appraisal forms used for the evaluation of employees.

1. *Ability to Adapt.*

Question: Is this employee quick to grasp new ideas and apply them in his work?

(a) Understands only after repeated trials under supervision.
(b) Understands after a detailed explanation of the problem and method but does not require continuous supervision while learning.
(c) Readily understands if the problem and method are carefully outlined to him.
(d) Requires little or no help in order to understand a new method and put it into practice.

2. *Diligence and Application*

Question: Is this employee a hard worker?

(a) Wastes time walking about the job, talking to others, stopping to watch other operations, etc.
(b) Works fairly steadily, although requiring an occasional prodding.
(c) Works steadily and does not interfere with or waste the time of others.
(d) Is an outstanding worker, habitually driving himself hard.

3. *Cooperation with Others.*

Question: Does the employee get along well and work successfully with others?

(a) Annoys and irritates others.
(b) Although not having any outstanding bad traits of disposition, the employee does not fit readily into a group.
(c) Is acceptable to associates and works well with them.
(d) Promotes good feeling in any group where assigned.

4. *Quality of Work.*

Question: Is the employee an accurate and careful workman?

(a) Work is inaccurate and below average in volume.
(b) Few errors normally. Quantity of work done is as expected.
(c) Outstanding worker. Performs all tasks exceptionally well.

(d) Work is accurate, quality is high and volume is better than average.

5. *Making Decisions.*

Question: When faced with the need for making a decision on some matter outside of the employee's daily routine, how does he go about doing so?

(a) Jumps to conclusions, does not consider all the facts, fails to foresee the results of his decisions.

(b) Although considering all the facts to the best of his ability and endeavoring to weigh them carefully, cannot always foresee the results of his conclusions.

(c) Considers the facts carefully and most decisions are acceptable.

(d) Decisions are sound and based on a thorough analysis of the facts.

6. *Manner and Appearance.*

Question: How does the employee's manner and appearance impress those who have only casual dealings with him?

(a) First impression is not favorable; he may irritate others.

(b) Would be acceptable if certain defects such as (here mention the defects) were corrected.

(c) Has an agreeable manner and appearance.

(d) Usually inspires highly favorable comments.

7. *Job Contribution.*

Question: To what extent does this worker contribute new ideas or make valuable suggestions for improvement?

(a) Has never, to my knowledge, suggested any change from the established routine.

(b) Has made occasional suggestions, but these usually have to do with minor matters.

(c) Has suggested worthwhile changes.

(d) Constantly comes up with productive ideas.

8. *Initiative.*

Question: Will this man act in other than routine matters when not given specific instructions to do so?

(a) Will not take the initiative and will not act unless told to do so.

(b) In minor deviations from routine, will act voluntarily.

(c) In most matters, will act voluntarily.

(d) Is something of an "eager beaver" and requires a degree of restraint in some situations.

9. *Speed.*

Question: Is the employee a fast worker? Can he be depended upon to finish his work on time?

(a) Habitually fails to finish work in the time alloted to do it.

(b) Although he usually does finish the work on time, it cannot be certain that he will do so.

(c) Always confident that job will be completed in the time alloted to do it.

(d) Often surprises by completing a job ahead of time.

It can be seen at once that a report based on these questions will be informative. It will cover all essential matters, and at the same time will not include a lot of deadwood that has no relation to the situation. Do not follow the answers to the letter. Use them as a guide and modify them to fit the individual.

As you are considering only one factor at a time, your judgment is less apt to be influenced by others. You are not so likely to give the pleasant and congenial employee a higher rating for quality and quantity than is deserved. On the other hand, you will not be unfair to the disagreeable employee who is nevertheless a steady and dependable workman.

Ranking Employees

Sometimes the supervisor is asked to "rank" several men—that is, list them in order of competence from high to low and leave the final decision of selection to a supervisor. This, for a man who has never attempted to do it, is a very difficult job and one that he will not know how to approach. How much weight is to be given to one quality or another? The safest, simplest and best method is probably what is called "paired comparisons" in which each man is compared with everyone else against the job requirements.

Let us say that we are to rank five prospects. Instead of calling them A, B, C, etc. we will give them names: Adams, Brown, Clay, Davis, and Evans. We now set them down like this:

Adams / Brown	Adams / Clay	Adams / Davis	Adams / Evans
	Brown / Clay	Brown / Davis	Brown / Evans
		Clay / Davis	Clay / Evans
			Davis / Evans

You will observe that every man of the five is paired with every other man.

The next step is to decide on the "general" requirements, if a general estimate is to be made, and the "special" requirements, if the men are being ranked for a particular job.

General

(1) Fast learner
(2) Hard worker
(3) Congenial
(4) Accurate and careful
(5) Makes good impression
(6) Makes valuable suggestions
(7) Makes good decisions
(8) Finishes work on time

Special

(1) Specialized knowledge
(2) Good mechanical background
(3) Can handle paper work well
(4) Can put his ideas across
(5) Can travel
(6) Neat and careful with his appearance
(7) Possesses the temperament for the job
(8) Has practical ability and is creative

Some men will be better at one thing than another. Few will have all the qualifications in a high degree. We must rate all of the men for all the qualities. We can even assign relative values to the requirement.

Going to the comparisons, we ask who learns faster—Adams or Brown? If it is Adams, we assign the value to Adams. We ask the same question of Adams and Clay, of Adams and Davis, and so on through the comparison. We take the next question, "Who is the harder worker?", deciding between the two in each pair.

After this has been done for each pair and for each quality, then add the values to each man's score. The man with the highest score ranks the highest and so on down the line. If two men rank the same, their names should be put side by side.

In making such a ranking, it is always a good idea to list the qualities upon which the men have been ranked.

Common Errors in Evaluating the Work of Employees

In preparing any evaluation report regarding the work of employees, the following should be given due consideration.

1. Any ranking or rating on your part must be based on actual observed performance unless you actually note on the report that the opinion is that of others.

2. Watch out for what is called the "halo effect". This is a special name for the effect which one outstanding quality will have on our estimate of another. For instance a pleasant, likeable employee may be given a higher rating for quality of work than is deserved. Or the competent grouch may not receive the credit he deserves for his good work. This effect is held down by taking qualities one at a time.

3. The inclusion of matters unrelated to the job must be avoided. By this is meant such clearly irrelevant matters as the fact that a man is kind to his mother. But if a job does not call for some special knowledge, it is not fair to remark that a man does not have it *now*. If he should ever decide to try for a job which requires it, he may study and become very adept. If you have made his present laxity a matter of record, this may go uncorrected and the company will derive no benefit from his later acquired knowledge.

4. While you should not include unrelated matters in an evaluation of several men, it is perfectly proper to add special accomplishments to a report on an individual. You might mention that he reads Spanish or that he is going to night school and studying estimating or any other creditable matter that you think worthy of mention.

5. The habits of a man when off the job are not ordinarily proper matters for evaluation unless they have a direct effect on his work; i.e., he shows up drunk on the job. It is in this area that the supervisor must be most careful that when he reports is a matter of personal observation.

6. Ignore physical defects *as such* when evaluating a man. In other words, a man may qualify in spite of impaired hearing, or a limp. On the other hand do not allow yourself to be influenced by sympathy or admiration. Do not think to yourself, "He gets around mighty fine for a man his age" and rate him higher than he deserves.

7. It is proper to mention physical defects and qualify them, saying "This man has lost his left leg, but has an artificial leg and is quite able to do the work as well as a man without this defect." Or you may say, "This man has an artificial leg that slightly impairs his activity, but with proper assignment I have found this to be no limitation."

The Author

George C. Schmidt is Chief Draftsman, Campbell Soup Co., Camden, N. J.

Graphic Perspective

by Eleanor W. Thompson

Early graphical and literary records – scratched, incised, impressed, and drawn—on a variety of bizarre and picturesque materials may, or may not, capture the interest of the draftsman of 1960. It may give him pause, however, to reflect that drafting rooms as they exist today were unknown prior to the middle of the 19th century. And the best grades of paper for any use were opaque, cream-colored materials until the middle 1800's, whether made by hand or by the first papermaking machines.

Tracing paper, that ubiquitous tool of design thinking, did not arrive upon the drafting scene until the 1860's. Prior to that time, copies of drawings were generally made by tracing each line through the original drawing by use of a spiked wheel. These holes were then "pounced" with a bag of colored chalk, and the marks on the sheet of paper beneath were subsequently connected by men called "tracers."

Rag Papers

Paper, as we have said, was in extremely short supply until the middle of the 19th century. Despite the patenting of a papermaking machine by a Frenchman, Nicholas-Louis Robert in 1799, the scarcity of cotton and linen rags—virtually the only source of papermaking fibers—continued to plague the papermaking industry for nearly 100 years.

"RAGS make paper, PAPER makes money, M O N E Y makes banks, BANKS make loans, LOANS make beggars, BEGGARS make rags," went an old saying[1] of the 18th century. Cotton and linen rags, collected from all parts of the world, were baled or bundled, and shipped to the paper mills. When the bales were opened, loose dust and dirt first had to be removed by thrashing. The rags were then sorted into grades according to kind (cotton or linen), color, and cleanliness. Buttons, hooks, and buckles had to be cut off, seams opened to release dirt, and the larger pieces cut up by hand.

The first paper mill in America is believed to have been built in 1690 on Wissahickon Creek in Philadelphia by William Rittenhouse and William Bradford. Bradford, who owned a printing press in Philadelphia, is credited with wanting an independent source of paper.

Groundwood and Chemical Pulp Processes

The paper industry today is based firmly upon wood as the universal raw material. Indeed, the gigantic machines presently spinning out endless streams of paper could be supplied from no other source. In the last 125 years, the speed at which paper is turned out by machine has gone from a maximum of 100 feet-per-minute in 1867, to 200 feet in 1880, and to well over 2,000 feet at present. In 1897, the maximum width of a machine was 162 inches, making a sheet of 152 inches; now machines are built over 300 inches in width.[2]

A word is in order regarding the paper machines known as Fourdriniers. Although Nicholas - Louis Robert first invented the continuously operating machine to replace the intermittent hand-dipping of the mold, paper machines today do not bear his name. Nor is John Gamble remembered for the improved paper machine he patented in England in 1803. Rights to these machines were later acquired by Henry and Sealy Fourdrinier, and because of their financing and promotion, the machines became known as Fourdriniers.

The first groundwood papermaker was the wasp. A number of men, notably Reaumur, Schaeffer and Koops, observed his process, but it was not until 1844 that the groundwood process really got off the ground. One Chas. Fenerty of Halifax, Nova Scotia, produced a sheet of paper proving that wood, reduced by a "chafing machine", could be manufactured into paper. And in 1844 a German, Keller, patented a wood-pulp grinding machine which he sold to Henry Voelter in 1847. Voelter's improvements resulted in the production of wood pulp for newspapers. Two of these Voelter grinders, imported to Massachusetts in 1867, formed the first commercial mill in the United States.

Chemical processes for reducing wood to pulp are the soda process, the sulphite process and the sulphate process. All were developed in the second half of the 19th century. These three chemical processes and the groundwood process account for the greater part of papermaking fibers today.

Drafting Room Papers

Great improvements in the physical properties of base paper stocks have been made in the last 10 years. And yet it is interesting to note that the strength, uniformity of texture, and other required characteristics of tracing paper still are best met by 100-per-cent rag paper, carefully made from strong, uniform, new cotton rags such as white shirt cuttings. Clearly, some progress may be made by preserving the techniques of the past!

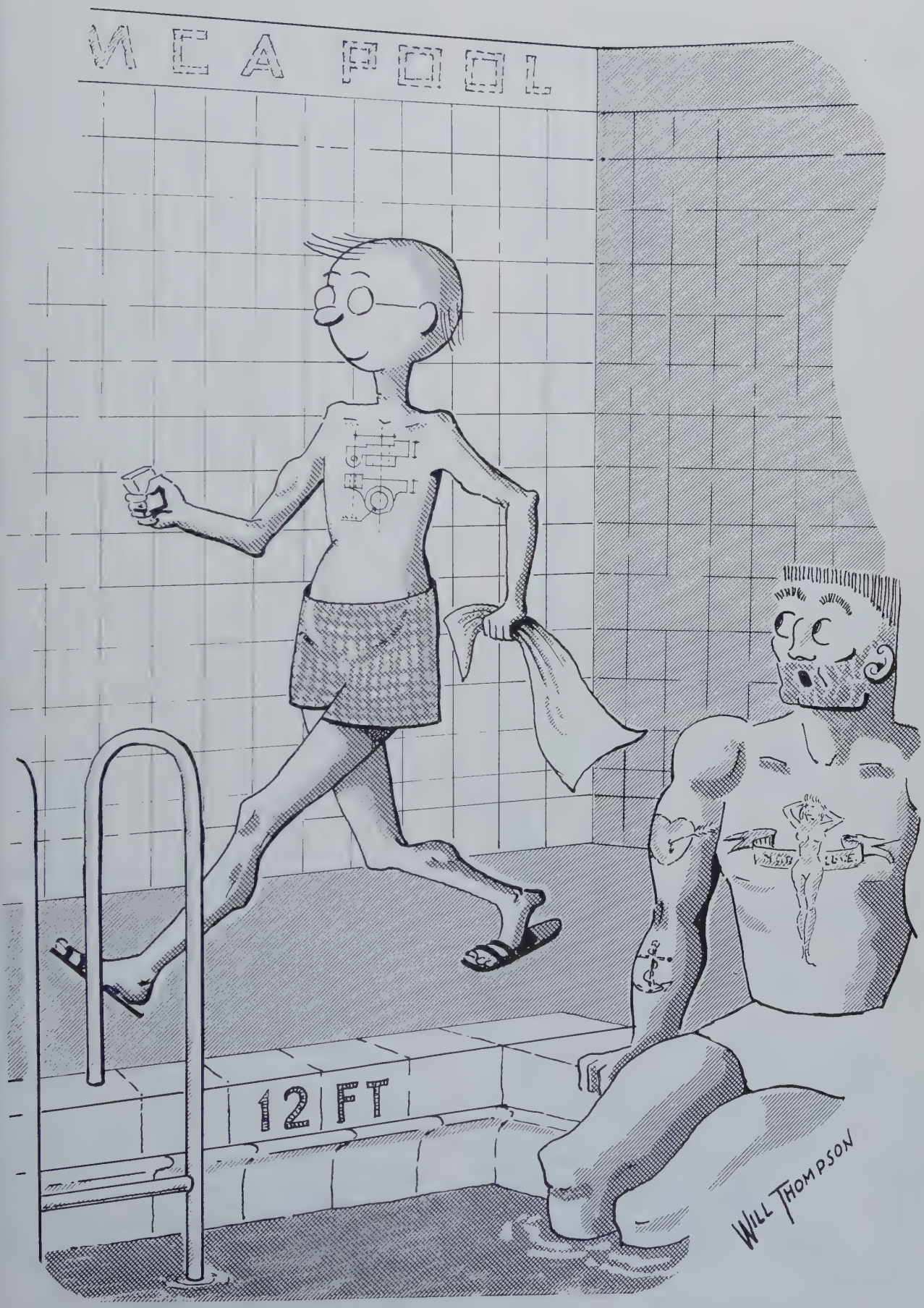
Next month, in our Reproduction Issue, we shall continue to chart progress—by looking backward at the first ferro-prussiate process of photography, called the blueprint process, and by looking forward at some new reproduction techniques and materials.

---

[1] Dard Hunter, **Papermaking** (New York, 1947)

[2] Edwin Sutermeister, **The Story of Papermaking** (S. D. Warren Company, Boston, 1954)

Smudge



A CHECKLIST FOR CHECKERS

(See Letters, page 4)

- ☐ 1. Is general appearance of the drawing satisfactory?
- ☐ 2. Is tracing free from dirt and tears? Is back of tracing clean?
- ☐ 3. Are figures, letters and lines correctly formed, clean and dense enough to assure good reproduction and legibility?
- ☐ 4. Does the drawing conform with Company Engineering Drafting Standards?
- ☐ 5. Are necessary views and sections shown, and are they in proper relation to each other?
- ☐ 6. Is drawing to scale?
- ☐ 7. Are all necessary dimensions shown?
- ☐ 8. Do witness lines extend to the correct surface?
- ☐ 9. Do arrowheads extend to the correct witness lines?
- ☐ 10. Do the dimensions agree with the layout and related parts?
- ☐ 11. Has consideration been given to dimensioning to avoid unnecessary calculations in the shop?
- ☐ 12. Are necessary notes, data and charts provided?
- ☐ 13. Does any duplication of information exist? For instance, are dimensions duplicated or does the same information exist on both the detail and assembly drawings?
- ☐ 14. Is there a duplication of parts?
- ☐ 15. Are all necessary symbols for finishing, grinding, welding, and other operations shown?
- ☐ 16. Are sufficient notes, including concentricity, parallelism, squareness & flatness shown?
- ☐ 17. Has the title block been filled in completely, and is information correct? Is the title correct?
- ☐ 18. Are all required approval signatures recorded? For instance, has the drawing been signed by authorized laboratory personnel for material, heat-treatment and finish specifications?
- ☐ 19. Are material and heat-treatment specifications given?
- ☐ 20. Are plating and painting specifications, either for protection or decorative purposes, given?
- ☐ 21. Are the correct drawing, die, casting, pattern and forging numbers given?
- ☐ 22. Is the stock size specified?
- ☐ 23. Are left and right-handed parts correctly designated, and is each part drawn in its correct position?
- ☐ 24. Are standard parts used wherever possible, and are they properly specified?
- ☐ 25. Are proper finish allowances provided?
- ☐ 26. Will the part interfere with other parts in assembly and operation?
- ☐ 27. Are proper limits or tolerances for desired fits given?
- ☐ 28. Are undesirable limit accumulations present?
- ☐ 29. Are stationary and movable clearances sufficient?
- ☐ 30. Are proper draft angles, fillets and corner radii given?
- ☐ 31. Is the approximate developed length of finished parts shown?
- ☐ 32. Are required trademark and manufacturer's identification instructions given?
- ☐ 33. Is the part designed to facilitate production?
- ☐ 34. Is the part sufficiently strong and suitable for the work it has to do?
- ☐ 35. Is there proper alignment of oil holes, drilled holes, and studs with mating parts?
- ☐ 36. Has accessibility been provided for welding and riveting tools?
- ☐ 37. Can the part or parts be assembled and disassembled with the necessary tools? For instance, is there provision for adequate wrench clearance for all nut and bolt heads?
- ☐ 38. How does the drawing compare with previously released drawings of similar parts?
- ☐ 39. Has the assembly drawing been changed to agree with the revised detail drawing?
- ☐ 40. Have installation drawings been revised to agree with latest production drawings?
- ☐ 41. Has the original drawing, when redrawn, been properly marked?
- ☐ 42. If consideration should be given to the prevention of dirt, grit accumulation and other foreign matter on oiled or greased working parts, have provisions been made so they can be easily cleaned and inspected?

(Courtesy of Barry Controls Inc.)

The Book Shelf

ENGINEERING DRAWING, by Eugene G. Paré. Henry Holt and Company, Inc., New York, 1959.
GRAPHICAL COMMUNICATION, by Earl D. Black. McGraw-Hill Book Company, Inc., New York, 1959.

I AM COUPLING these two books in one review because they were apparently published with the same assumption: that a "small" book would be a welcome change in the field of technical drawing. Here are two new books, both small, but addressed to distinctly different audiences. Therefore the coverage of topics is different, the language is different, the objectives are different.

There are many ways to make a book "smaller." One way is to cut down the number of pages but to make the pages larger! Another way is to cut down the number of topics; another, to cut down the number of topics and to treat them more sketchily; another to deal with all the customary topics but very sparsely. Still another way to make a small book is to cut down the number of topics but to improve the quality and the precision of the writing.

Engineering Drawing, by Paré, is in my opinion an example of an excellently written book with ample coverage in a difficult technical field. It is intended to satisfy the needs of students in colleges of engineering at a time when the place of engineering drawing in the engineering curriculum is being hotly debated. In a condensed treatment of any discipline the key issue is the selection of topics. I think Paré has made a superb choice. The topics omitted are the less important ones. Those he has included should satisfy the majority of teachers. The illustrations are excellent. The appendices are full of essential stuff.

All in all, Paré has done a fine book for students of engineering. If your work touches engineering drawing, the book deserves a place in your library.

GRAPHICAL COMMUNICATION, by Black, is addressed to vocational and technical students and engineering technicians. The writing is not patronizing but it is at the appropriate level. The slant is toward techniques and processes. Again, the selection of topics is necessarily limited. I suspect that the topics covered in the book directly reflect the courses that Black teaches at the General Motors Institute. For example, tool and die drawings are given a rather light treatment in thirteen pages, not really enough for a student to study by himself. Paré doesn't mention the subject at all. Because of their respective audiences, both authors are right.

Black gives a lot of space, thirty-three pages, to architectural drawing but he gives only eleven pages to sectional views. I'd be inclined to disagree with these emphases, but I realize it's a matter of orientation. The author's orientation is especially obvious in his interesting, short chapter, "Drawings for Processes."

THE DRAFTSMAN DECIDES

by Irwin Wladaver, Associate Editor

Somewhere along the line the draftsman decides.

Mr. Samuel Leven is Chief Engineer, Stationary Compressors, of the Joy Manufacturing Company. He has helped service and has demonstrated coal mining machinery underground. On his way up to his present job he invented many of the features of the Joy Continuous Coal Miner and designed and built the first two working machines. This represented a tremendous improvement over the back-breaking, dangerous labor of getting coal out of the earth.

Obviously he knew what he was talking about. Mr. Leven was answering my question about the importance of simplicity and flexibility in the design of the working parts of air compressors. "Take this cylinder for example. Not much to it. Easy to machine. Easy to service in the field. We use the same one in a dozen different applications. Anybody can design a complicated machine. But it takes real ability and experience—maybe a touch of genius—to design a simple mechanism that will do a complex job. And right here in the Michigan City plant we have two, maybe three of the five best compressor-designers in the world."

Of course I was impressed. I was standing in the middle of the largest unbroken production area I had ever seen—500,000 sq. ft., Mr. Leven said. I wouldn't dare a guess at the number of compressors I could see in various stages of completion, from empty metal shells to tremendous crates on railroad flatcars ready for shipment to customers ten thousand miles away.

I wasn't sure my next question would make any sense: "How about exteriors—I mean housing design? Do you have industrial designers doing your styling? Is style a factor in the sale of a compressor? Who is responsible for what it looks like when it leaves the shop?"

"Somewhere along the line the draftsman decides. In compressors, appearance is quite secondary. Our customers want to know the performance curve, the reliability, the cost, the shipping date. Exterior appearance has to depend on the function of the machine. Anyone who designs to please himself winds up pleasing nobody else."

"Does this mean, Mr. Leven, that your draftsmen only follow instructions, that they contribute nothing to the basic design of your products?"

"Now, wait a minute." he answered. "I didn't say that. What I said means that we entrust certain responsibilities completely to qualified draftsmen. But that's not all. Every man in this office knows he's under obligation to the Company to give us everything he's got. Many of our draftsmen do heavy designing. Some of our top engineers moved up from drafting. I started on the board myself. I don't care what a man's title is. I don't care where he got his technical education or how. I care about only one thing: *Is it good for the Company?*

If A Man Knows

If a man knows how to improve any product we manufacture, if he knows how to cut the cost of production by one cent—or thinks he knows, or if he knows how we can speed up production without impairing quality, he owes it to the Company to speak up. As I see it, the way to get ahead in any job is to do more than one job. If what a man does is good for the Company, it'll be good for him, too. My men can go as far as they want to. It's up to them and they know it."

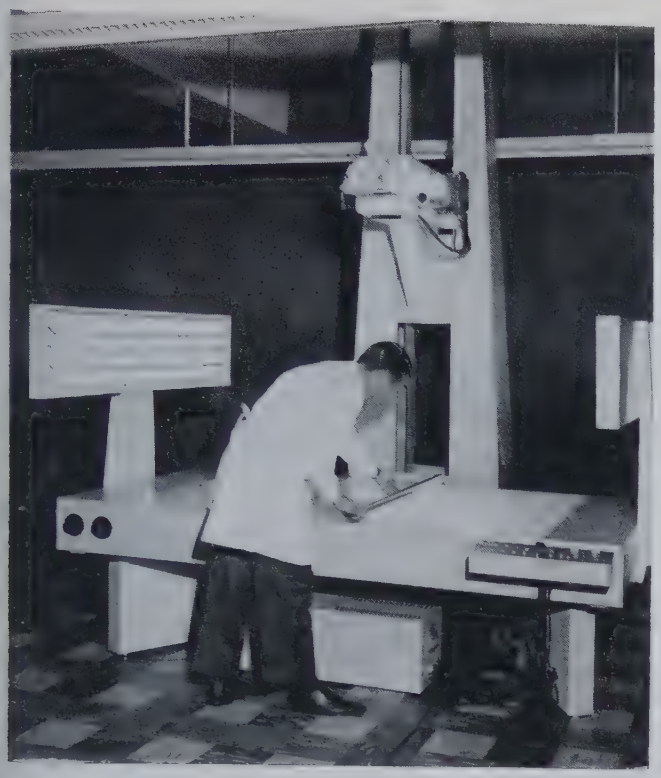
In every plant that I've visited in the past year, it's the same story: management constantly looking for people with imagination and courage to assume greater responsibility. For draftsmen, the opportunity is greater than it has ever been.

As time moves along, it is becoming increasingly difficult for companies to keep clearcut their classifications of engineer, draftsman, detailer. With the colleges of engineering moving precipitously toward science and away from empiricism, the art of engineering will suffer more and more neglect. Draftsmen will have to move up even more than they have in the past.

When a man is prepared to do a better job, the job will be ready for him. Who is going to be the man that moves up? Somewhere along the line the draftsman decides.

The Author

Dr. Irwin Wladaver is Associate Professor of Engineering Drawing at the College of Engineering, New York University. He is on sabbatical leave for one year from his University duties, visiting industrial plants and interviewing engineers both here and abroad.



Miniaturization System

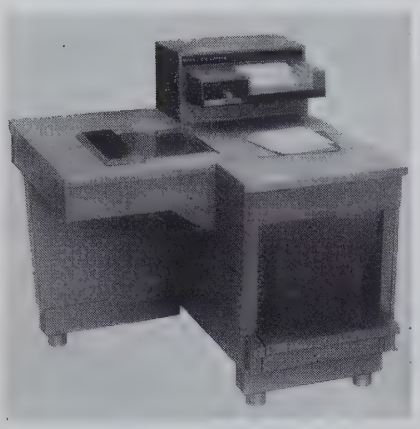
Combination camera-projector is versatile reproduction tool

SOMETHING NEW in film reproduction equipment for engineering drawings—a combination camera-projector for both 105mm and 35mm film—has been announced by Keuffel & Esser Co., 300 Adams St., Hoboken, N. J. Called Micro-Master, the unit claims a number of "firsts" important in tailoring engineering reproduction work to a variety of job requirements.

It is the first production model 105mm camera, for example, capable of as much as eleven diameters of reduction, and as little as three. Its 35mm range is from 8 to 30 diameters. It is the first completely motorized camera-projector: camera, projector magazines, filter, and focusing are motorized. Still another first claimed for this new industrial miniaturization camera are completely removable film magazines. At any time the operator can change from projector to camera, or from 105 to 35mm, or switch from color to black-and-white line, or continuous-tone film. Another first is a light source that automatically regulates itself as the focus is adjusted at the control panel. And it is the first planetary miniaturization camera for tracings up to 42″ by 64″.

Accessory items completing the system include portable and large-size viewers, and viewer-printers of either photographic of electrostatic type. A complete line of processing equipment and supplies, including developing reels, processing tanks, chemicals, films, cloths, and papers are also available from K&E.

New Products



Xerographic Copier

Operating on the dry, electrostatic principles of xerography, a fully automatic copying machine prints permanent copies of any written, drawn, typed or printed documents up to 9 by 14 inches in size. Produced by Haloid Xerox Inc., Rochester 3, N. Y., the XeroX 914 Copier prints all colors. It also permits copying from bound books or magazines. Since the device uses no treated or sensitized materials, prints may be made directly on ordinary white or colored paper, offset paper master material, card stock or vellum. The machine is put into use by placing the original document over a glass panel on the desk top and dialing the desired number of copies from 1 to 15. Copies are printed size for size at a rate of six-per-minute and automatically stacked by the machine.

Film Transparencies

Color or black-and-white transparencies may be made in five minutes from any printed material available on clay-coated paper, using a product called Transpara - Film. Manufactured by Seal, Inc., of Shelton, Conn., the material is available in a kit that includes 100 sheets of film, polished plates, felt, and a developer. In the Seal Transpara-Film Process, a picture is reproduced in its transparent form, the same size as the original. The finished transparency may be mounted in a frame for use in overhead projectors.

Blueprint Folding Machine

Efficient blueprint folding is accomplished by a machine that handles paper up to 42 inches wide and 40 feet long, at a rate of 12 inches-per-second. Manufactured by The Cincinnati Milling Machine Co., Special Machine Div., Cincinnati 9, Ohio, the 42″ Blueprint Folding Machine folds automatically and continuously as long as the operator keeps the foot switch depressed. The operator's function is limited to inserting the paper, removing the finished folded paper, and monitoring the machine's operation. The machine produces accordion folds, 11 inches wide. Time required to load and unload is approximately 45 seconds.

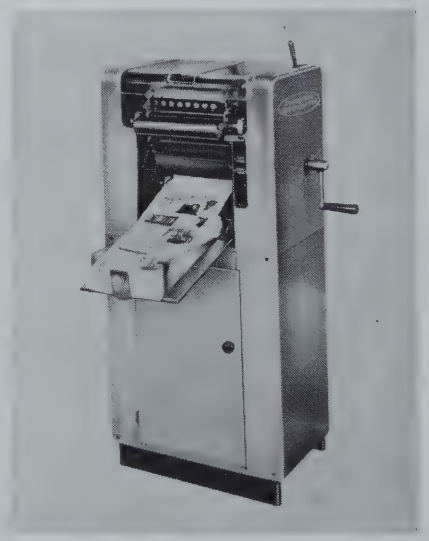


Photo Offset Press

For the small reproduction department a compact and quiet machine that is fully automatic and friction fed handles a variety of photo offset printing jobs. Called Copease Copilith Junior, the press is available in the United States from Copease Corp., 425 Park Ave., New York 22, N. Y. It accommodates paper up to 9 by 14 inches in size, with an image area of 8¼ by 13 inches, at a speed of 4,000 copies per hour. The Copilith Junior is said to be simple to operate. If a paper misfeed occurs, it cuts off automatically. Furnished with ¼-hp motor, it plugs into any regular 110-volt electrical system.

Portable Drafting Equipment

Precision drawing equipment in a portable case is offered to travelling engineers, architects, and designers. Drawing board, T-square, triangle, holemeter, compass and protractor are designed into a functional unit called Design-Pak. Manufactured by D. W. Price Corp., Los Angeles, Calif., and represented by Tele-Muff Co., 1719 First St., San Fernando, Calif., the unit is housed in a briefcase folder that permits the drawing board to be used flat or tilted to eight degrees. According to the manufacturer, the drafting machine will remain true at any setting over a standard 8½ by 11-inch drawing sheet.

Diazotype Processor

A 54-inch, ammonia developing diazotype processing machine with a top speed of 125 fpm, has been announced by Technifax Corp., 195 Appleton St., Holyoke, Mass. Called the Hi-Q Diazoprocessor, the machine utilizes a new ammonia distribution and evaporation system said to insure full development of any diazo-sensitized material at any speed at which it can be printed. Printing speeds are continuously controllable. Long tracings are automatically rolled up while short tracings are normally stacked; operation may be converted at will. An electrically operated static eliminator ionizes the air around the printing cylinder- insuring separation of tracing and print. The 54-inch feed board is continuously adjustable to different depths from 15 to 27 inches. Fifty-four inch masters can be handled with margin to spare.

(For additional information regarding the new products described here, contact the manufacturer directly. Complete addresses are included.)

New Products

Whiteprinting Machine

A moderately priced copying machine with a one-step feed, will print anything typed, written, drawn or photographed on reasonably translucent material at speeds up to 50 fpm. Manufactured by The C. F. Pease Co., 2601 West Irving Park Rd., Chicago 18, Ill., the whiteprinter will accommodate prints up to 42 inches in width and of practically any length. The original and sensitized material are fed into the machine and, after exposure to the 4,000-watt mercury vapor lamp, the print is automatically conveyed into the developer while the tracing or copy is returned to the operator for additional feedings. Finished whiteprints are automatically stacked in front or rear trays, dry, flat and ready for use.

Steel Drafting Tables

Drafting tables with standardized bases, designed for interchangeability of varying sized tops are offered in enamel-finished steel. Manufactured by Anco Wood Specialties, Inc., 71-08 80th St., Glendale 27, N. Y., these Ancosteel tables are adjustable through all working angles to 90° vertical. A bookshelf is provided and a print drawer may be installed from front or back, the full width of the base.

Polyester-Base Drafting Film

Drafting film on a 0.004-inch polyester film base (made in one complete process) is a durable medium recommended for original pencil or ink drawing of all types; typewritten or printed material can also be applied to the film. Developed by E. I. du Pont de Nemours & Co., Inc., Photo Products Dept., Wilmington 98, Del., Cronaflex drafting film is available in two types; with matte drawing surface and glossy back surface (Order Code 1-DF-4) and with matte drawing surface on both sides (Order Code 2-DF-4). According to the manufacturer, the film retains fine reproduction detail, has a high printing rate on blueprint or diazo printers, is both durable and flexible, and possesses outstanding dimensional stability.

New Literature

Electronic Data - Automation Brochure, called Univac Narrator, describes an order-processing, inventory, control and sales analysis application of the Univac File-Computer System for the Associated Grocers Cooperative in Arizona. The illustrated, 17-page publication details the manner in which this equipment accomplished the rapid interchange of the constantly varying information required for quick, dependable order processing. Copy of this Univac Narrator can be obtained at any Remington Rand branch office or by writing to the company at 315 Park Avenue South, New York 10, N. Y. and requesting UN 1220.

Modern Mounting Manual and samples of all pictorial mounting materials are available without obligation from Seal, Inc., Shelton, Conn., manufacturers of dry mounting equipment and materials. These products range from film to repair materials for drawings, maps, charts, etc.

Photographic Drafting by the use of a special photographic typesetting machine is explained in a brochure offered by The Intertype Co., 360 Furman St., Brooklyn 1, N. Y. The device, and system, were developed initially for "drafting" wiring diagrams. Electronic circuits, piping layouts, flow charts, and constuction and architectural drawings have also been produced with the system. The booklet is available free.

Air-Brush Bulletin (A59-1R), including price list, may be requested from Binks Mfg. Co., 3114-44 Carroll Ave., Chicago 12, Ill. Subject of the illustrated bulletin is the Binks Wren Air-Brush and accessories.

Ways to Save Drafting Time With Intermediate Prints, a booklet published by Frederick Post Co., 3650 North Avondale Ave., Chicago 18, Ill., may be obtained on request. Eleven practical techniques, ranging from the use of corrector fluids to composite overlays from several originals, are described and illustrated.

Diazotype Intermediate Materials, a 6″ by 9½″ portfolio of five Vapo Intermediate samples on a variety of new base materials, is offered by Frederick Post Co., 3650 North Avondale Ave., Chicago 18, Ill.

Drafting Pen Brochure (Form SP-57-42) presenting the Riefler Grafika, a reservoir-type pen accommodating all inks and equipped with 11 interchangeable nibs for all types of work, is offered by Ozalid Div., General Aniline & Film Corp., Johnson City, N. Y. Price list is included.

Drafting Film Folder (Form No. SP59-13) containing a sample of polyester - base Duratrace drafting film, may be requested from Ozalid Div., General Aniline & Film Corp., Johnson City, New York.

Microfilm Filing Systems Brochure (Form F571), presenting a line of jackets and aperture cards for unitizing microfilm images, is offered by Remington Rand, Div. of Sperry Rand Corp., 315 Park Avenue South, New York 10, N. Y.

Retrievable Miniaturization is the title of a booklet (Form No. 1159) dealing with a Continuous Reducing Printer and Continuous Photographer manufactured by Paragon Revolute Corp., 77 South Ave., Rochester 4, N. Y. The booklet outlines the application of this equipment to reduce print material costs, handling time, and filing space, without requiring drastic changes in drafting standards of printmaking systems. Specifications of printer and processor are given. The booklet may be requested from the company.

Photo-Composing Machine Pamphlet (Form 315-10/59), describing a typewriter-size unit that sets display type by dialing, may be requested from Vari-Typer Corp., Subs. of Addressograph-Multigraph Corp., 720 Frelinghuysen Ave., Newark 12, N. J. Called Model 800 Headliner, the device automatically processes and delivers reproduction proof of headlines.

Photomechanical Typesetter Brochure (Form No. TS-103 20M959LC) describes a system for text composition utilizing a portable device that can be operated with standard typing skills. Developed by American Type Founders, 200 Elmora Ave., Elizabeth, N. J., the ATF Typesetter produces simultaneously both typewritten proof and a perforated tape. The tape, complete with specifications for letter spacing, word justification, etc., is then inserted into the photographic unit which reads the tape and transfers the proper letter images from the tape disc onto film or photographic paper. The film, when developed, can be used for platemaking. The brochure is available on request.

Slides - On - The - Spot, a brochure (F1870C) describing the Polaroid transparency system that results in a finished black-and-white transparency in two minutes, may be requested from Polaroid Corp., Customer Service Dept., Cambridge 39, Mass. These 2¼″ by 2¼″ transparencies may be mounted in engineering reports with transparent tape and fed through a diazo copying machine for multiple copies, or projected directly for audio-visual work.

Tips-Techniques and Drafting Aids, a 32-page illustrated booklet, is now available from Alvin & Company, Inc., 611 Palisado Ave., Windsor, Conn. The pamphlet, is described as useful for instructors, students, architects, engineers and designers and draftsmen. The booklet is divided into the following classifications: Helpful Drawing Techniques, Simplifying Drawing Practices, Protecting Prints and Drawings, Tips for Drawing Lines and Curves, Modifying Equipment for Extended Use, and Getting the Most from Drawing Instruments. It is priced at 50c per copy.

Photo - Drafting Brochure, called *Microtronics 105 Apparatus,* describes a combination of units to (1) photograph the original, (2) process and store the film, and (3) project images. The brochure may be requested from Photostat Corp., Rochester, N. Y.

(Copies of the literature reviewed can be obtained directly from the manufacturer or publisher. Complete addresses are included.)

New Literature

Paper Catalog, containing prices for 17-, 20½- and 24-pound Whiteprint Paper, Transparentized Sepia Intermediate Paper, Blueprint paper and Van Dyke Negative Paper, in a variety of cut sheets and roll stock sizes, may be requested from The C. F. Pease Co., 2601 W. Irving Park Rd., Chicago 18, Ill.

Vertical and Roll Filing Equipment, Catalog No. 9-59 (AIA File 35-H-32), showing a variety of stands, racks, cabinets, envelopes, and roll files for engineering drawings, is offered by Plan Hold Corp., South Gate, Calif. Price list accompanies catalog.

Engineering Microfilm System Flo-Chart, a simplified pictorial presentation, may be requested from Remington Rand, Div. of Sperry Rand Corp., 315 Park Ave. South, New York 10, N. Y.

Dry-Process Whiteprinter Bulletin (No. 58-A-1), presents the 26-inch Arrow whiteprinter manufactured by Peck & Harvey Mfg. Corp., Chicago 45, Ill. Designed for reproduction of cut-sheet size originals, the automatic machine operates at a rate of up to 75 feet-per-minute.

Reader-Printer Brochure, MF-CLB (9915)HS, describing the Thermo-Fax "Filmac 200" machine, is offered by Thermo-Fax Sales, Inc., Subs. of Minnesota Mining & Mfg. Co., 1780 Broadway, New York, N. Y. The reader-printer makes prints of engineering drawings and other subjects from 35mm microfilm in 18" by 12" or 18" by 24" sizes.

Microfilm System Filing Equipment, manufactured by Rol-Dex Div., Watson Mfg. Co., Inc., Jamestown, N. Y., is described and illustrated in a brochure (No. RDMS 5/59 H 20M) available from the company.

Photographic Enlarger Pamphlet (5M 10-59), describing the Logetronic B-10 Enlarger, may be obtained by writing to LogEtronics, Inc., 500 East Monroe Ave., Alexandria, Va. The device is said to aid in the production of photodrawings.

Photocopying Machine Brochure, giving basic information on wall-mounted and desk Copycat machines in 9- and 14-inch width models, may be obtained from Copycat Corp., 215 Fourth Ave., New York, N. Y. Photocopy paper, offset plate, and multicopy paper price lists are given.

Automatic screening film is described in Kodak Pamphlet No. P-21 (2-56 GL), titled *Kodalith Autoscreen Ortho Film—How It Works, How To Use It.* In engineering applications, multiple reproduction of photo-drawings is facilitated by using this film, since the film negatives are readily convertible to offset plate form. The pamphlet may be obtained from Eastman Kodak Co., Sales Service Div., Rochester 4, N. Y.

Microfilm Duplicates Bulletin, presenting the characteristics of Ozalid Microfilm Duplicates, is available from the distributor, Graphic Microfilm Corp., 112 Liberty St., New York 6, N. Y.

The Editor's Board

The Basic Importance of Drafting

IF WE APPROACH the subject of the responsibility of draftsmen honestly, we must admit that drafting as a profession carries very little responsibility or acceptance from management. And yet, if analyzed correctly, it becomes apparent that every time a draftsman picks up a piece of tracing paper he is, in effect, being assigned a blank check by the company, which he alone is going to fill out and spend.

There are two major operations that are carried on by most industrial firms. These are manufacturing and selling. We take our manufacturing costs, add a percentage for profit, and then try to sell the product so that the firm can satisfy its stockholders in the way of dividends and growth. It can readily be seen that the draftsman, while unrecognized, is basically creating—by the lines he puts on paper—the cost structure that must be followed by manufacturing and will ultimately result in a selling price that may, or may not, be competitive with other manufacturers.

IF, for example, a draftsman finds that a tolerance of 0.001-inch is satisfactory to meet his needs but decides that, to be on the safe side, he will split this tolerance in two and specify 0.005-inch, he has at least doubled the cost. This doubling of cost is then borne through manufacturing and ultimately results in an increase in the selling price.

While management spends a great deal of time and money training executives—in such places as the Harvard Business School—to make sure of an efficient manufacturing and selling organization, it is frequently found that the drafting organization is pretty much of an orphan, allowed to shift for itself as best it can. And yet, if one is to look clearly at the basic source from which information is generated, that is, to take a product from research and development and place it in production, it is the draftsmen or the board people who have had the most serious effect on price.

If the foregoing is discussed with management people, it will be found that they generally disagree. However, this disagreement is primarily because they do not understand that the drafting room is the place where costs are generated; they do not realize that steps can be taken to control or correct problems and troubles in this area.

It is entirely possible that some manufacturing firms might operate a great deal more efficiently if their chief draftsmen were raised to a level of importance comparable with that of accounting or sales executives who report directly to the President or to the Chairman of the Board.

by Jay H. Bergen
Associate Editor

Advertisers Index

GRAPHIC SCIENCE

ADVERTISING REPRESENTATIVES

NEW YORK—Charles E. Rhine, 103 Park Avenue, New York 17, New York. MUrray Hill 5-1745.

LOS ANGELES—Wettstein, Nowell & Johnson, Inc., 672 Lafayette Park Place. DUnkirk 8-2286.

SAN FRANCISCO—Wettstein, Nowell & Johnson, Inc. Jerry Nowell, 355 Stockton St. YUkon 2-9537.

PORTLAND—Wettstein, Nowell & Johnson, Inc., 337 Pittock Block, 921 S.W. Washington St. CApital 8-4107.

NEW!

This Eagle Turquoise Lifetime 1 lead holder with all these extra features . . .

NEW NON-SLIP CHUCK
holds lead firmly at any length you want. Lead can't be pushed back in barrel, won't twist in sharpener.

NEW SATIN FINISH METAL GRIP
is knurled for easier holding. Its extra length gives you more accurate control with less finger tension.

NEW ANODIZED ALUMINUM BARREL
is unbreakable. And it can't roll off the board because it's hexagon-shaped.

NEW PUSH BUTTON
instantly releases the chuck's grip on the lead at the touch of the thumb. It's colored for quick identification of grade.

ONLY $1.00

EAGLE®

All-metal construction makes it the buy of a lifetime.

EAGLE PENCIL COMPANY, DANBURY, CONN.
NEW YORK • LONDON • TORONTO • MEXICO • SYDNEY • BOGOTA

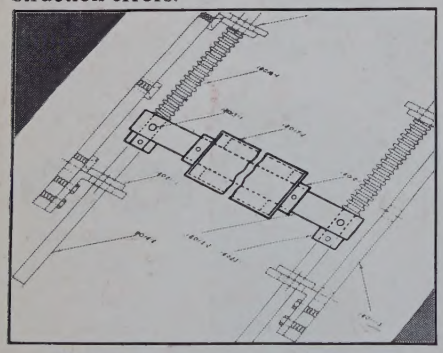
®Eagle Turquoise

PENCILS, LEADS AND HOLDERS

are the largest-selling in the United States.

Ever Want Prints Emphasizing Parts of a Drawing?

Engineers, architects and many other types of technical people often want prints that separate key parts of a drawing from the rest of it, and some weird and costly techniques have been used. This is understandable because the cost of *not* getting good separation or emphasis can also be shocking. Take the case of a large West Coast engineering organization constantly involved in plant construction. They used sepia prints of floor plans to lay out the electrical work. But the lack of contrast between the plumbing shown in the sepias and the electrical layouts added required hours of careful checking and frequent revisions, even caused some expensive construction errors.



Diazo print from special-blue image intermediate produces a sharp contrast between the parts to be emphasized and those to be subdued.

That's all ancient history now! Two of Dietzgen's numerous modern drafting-printmaking aids have turned this tough old chore into a picnic. They are new drafting media (one a polyester film and the other a vellum) diazo sensitized to produce a special blue image. The reproduction of your basic drawing on either of these media is bold and clear so drafting additions can be made without confusion or error. But when you make prints from the completed intermediate, the basic part in the special blue prints faintly (clearly visible but subdued) . . . while the added drafting, even in pencil, prints strong and bold. The results are perfect, easily and quickly obtained, delightfully inexpensive.

SOLVED: A COSTLY PROBLEM OF COMBINING DRAWINGS AND GRAPHS

Drafting time costing as much as $40 was used to draw a single grid . . . and draftsmen resented the tedious assignment.

A large manufacturer of automotive parts decided to plot their graphs directly on the drawings in order to end the nuisance of their being separated in handling, filing, plant interchange, etc. But this created many new problems. Tracing or drawing the grids in position proved costly, as much as $40 each in drafting time. They were rarely accurate and never uniform in character. The lines often smudged and usually reproduced poorly. The work created a morale problem because draftsmen resented the tedious assignment.

One of Dietzgen's modern drafting-printmaking aids furnished a perfect answer! It is a light-weight drafting film which is adhesive-backed and furnished printed with a stock grid. It is simply mounted in place and the grids are sharp, clean, clear and uniform, so much more accurate that fewer plotting points are needed to develop the graphs. Reproductions were so noticeably better as prints moved through other departments and associated plants that the change was investigated and quickly adopted. Much needed drafting time and capacity is saved and the reduction in costs amounts to many thousands of dollars a year.

Drafting-Printmaking Handbook reports new techniques for solving engineering and production problems

This new 36 page handbook describes a wide variety of engineering and production problems that have been solved with advance techniques in drafting and printmaking pioneered by Dietzgen. The concise, problem-solution approach suggests ways in which you may improve the efficiency within your engineering department or eliminate production bottlenecks. Write today on your company letterhead for the Mechanics of Modern Miracles. Ask for Publication SPD2-A10. Eugene Dietzgen Co., Chicago 14, Illinois.

DIETZGEN

EVERYTHING FOR DRAFTING SURVEYING & PRINTMAKING